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Ministry of
Northern Development
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Division

Ontario Geological Survey
Open File Report 5721

Building Stone Inventory of the Sudbury Resident Geologist's Area

1989

Ministry of Northern Development and Mines
Mines and Minerals Division
Ontario

ONTARIO GEOLOGICAL SURVEY

Open File Report 5721

Building Stone Inventory of the Sudbury Resident Geologist's Area

by

J.K. Lacey

1989

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V.G. Milne

V.G. Milne, Director
Ontario Geological Survey

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ABSTRACT

The granite Building and Dimensional stone industry in North America has shown continued growth over the past few years. The majority of this increase is exterior panels of landmark buildings and flooring tiles. The demand for new colours and distinctive textured granite is steadily increasing.

This report contains detailed information and references for 14 areas with good potential for producing dimensional stone. Detailed information and history of the three currently producing granite quarries in the Sudbury Area are also included. They include Dana Black Granite, Killarney Tweed and Positano Granite.

This study, funded by COMDA (Canada Ontario Mineral Development Agreement), is designed to stimulate exploration for granite Building Stone in the Sudbury Area, and to encourage development and support of the three active quarries.

BUILDING STONE INVENTORY

OF THE SUDBURY RESIDENT GEOLOGIST'S AREA

By

Kerry Lacey [1]

[1]Geological Technician, Ministry of Northern Development and Mines, Sudbury

Manuscript approved for publication by V.G. Milne, Director, Ontario Geological Survey, April 17, 1989.

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INTRODUCTION

This report presents the results of a one year reconnaissance survey to inventory potential dimension stone 'granite' deposits within the Sudbury Resident Geologist's area. The study was initiated under the Canada Ontario Mineral Development Agreement (COMDA) to continue and expand on an in-house building stone inventory started in 1986 by R. W. Campbell.

The intent of the project is to stimulate exploration and the development of Dimension Stone quarries in the Sudbury area, ultimately to support a manufacturing centre using local granites. Throughout this report the term Dimension Stone refers to construction granite quarries, i.e. those that produce 10 to 20 tonne blocks.

Granite is one of man's oldest building materials and considered to be the premium material for beauty and durability. Recent advancements in construction techniques and processing technology have greatly increased the use of granite in modern architecture. This increased market combined with the mainstay of the industry, monuments and monumental works (accounting for 40-50% of all Building Stone, Les Consultants Sogir Inc., 1984), have recently spurred great interest and exploration throughout Ontario and Canada. Worldwide demand for new colours and textures of granite has not been greater.

Architectural uses include interior and exterior wall veneer, floor tile, or strictly ornamental applications. All methods rely on mechanical anchors to secure the stone in place. Individual panels can range in thickness from 1 cm to 4 cm and may reach 3.5 m in length depending on use and weight requirements.

Most dimension stone used in construction panels tends to be medium grained massive to slightly foliated. Small textural variations such as mafic knots, veinlets or occasional pegmatitic sections are noticeable in most large installation projects. Monuments generally demand finer grained homogeneous granite with a uniform colour and texture. Ideally a quarry will produce material suitable for use as monuments and construction applications.

The exposed surface of dimension stone or monument granite can be finished in one of three ways: polished, sawed, or thermal finish. Colour and texture can be influenced by the finish and is a consideration in evaluating a property. Polished surfaces tend to darken the colour of the stone leaving a high contrast or near three dimensional effect. Textured finishes (saw cut or flamed) tend to lighten the colour and mask any irregularities. Large installation projects will apply all three finishes to the same granite for a contrasting effect and practicality. For example, sidewalks and stairs are saw cut or flame finished for traction.

A profitable dimension stone quarry must have limited to moderate jointing or fracturing to allow for the extraction of consistent, uniform, rectangular quarry blocks approximatly 1.5 x 1.5 x 2.6 m that range in weight from 13 to 20 tonnes. Smaller blocks may still prove profitable if the granite is of high quality or of unique colour and texture. The minimum size required for processing is 1.5 x 1.5 x 1.5 m as a dimension stone (personal communication A. Falzi, Granitex, 1988).

This study describes locations which will allow for moderate to large block removal (1.5 x 1.5 x 2.5 m minimum). This assessment is based on joint and fracture density as observed on surface. The third dimension (sheeting inclined or horizontal) may not be fully exposed and interpretation may be somewhat speculative. The true size of quarryable blocks can only be determined while the deposit is being quarried.

The testing of a deposit however is only the first step in a long process of developing a profitable dimension stone quarry.

Start up costs include site preparation, testing, transportation to manufacturing plants, and promotion of the stone. All are time consuming and expensive. Establishing a market for a new dimension stone can take from one to three years with little or no revenue generated in this time.

The Sudbury area also must deal with the problem of multiple land use, as many of the high potential sites are patented land located near power lines, roads and populated areas.

A producing dimension stone quarry has limited environmental impact on its surroundings. It is a relatively quiet operation, but does produce some dust and truck traffic.

The nearby communities must balance these factors against direct local employment, increased revenue, and regional development.

Field investigations in 1988 have produced promising results. Several areas of granitoid rocks with limited to moderate fracturing were outlined. Assessment of these prospects are based on a combination of natural characteristics, critical for development of a quarry. The American Society for Testing and Material (A. S. T. M.) has set standards which materials must meet for construction use.

Consistency in colour and texture is necessary to maintain equal quality in all blocks. Variegated and contorted gneissic rocks possess greater problems in quarrying due to rapid colour and texture changes. Yet they are the ones which are in high demand by European markets.

The presence of sulphides will effectively limit the stone to

internal use. Sulphides and some ferromagnesian minerals weather rapidly, polish dull and may stain the finished surface. Garnet and biotite pose problems during polishing due to their greatly different hardnesses and tendency to pluck out of the surface.

Location and size of the deposit are also important factors in the evaluation. If the deposit is located too far from a major road the cost of road building and maintenance may be too high to establish a quarry.

17 sites have been documented by reconnaissance mapping in the Sudbury District. These sites show wide variety in colour and texture and are well suited for dimension stone. Refer to insert map (rear pocket) for locations.

The following histograms illustrate the large increase in demand for dimension stone in North America and abroad. Figures 1 and 2 show the dramatic increase in exports of Canadian dimension stone since 1986. As shown, the United States is the largest consumer of Canadian granite. A point that must be made here is that 80% of Canadian exports are quarried in Quebec.

Figures 3 and 4 illustrate the imports of granite into Canada by total amount and a breakdown by origin. These histograms deal with all imported granite, grouping monuments and construction slabs. South Africa is one of the major sources of granite, usually monument granite. Shipments from Finland, Italy, Norway

and Sweden are generally granite slabs for construction use. An increase in imports from these four European countries demonstrates that more and more granite is being used in the construction industry.

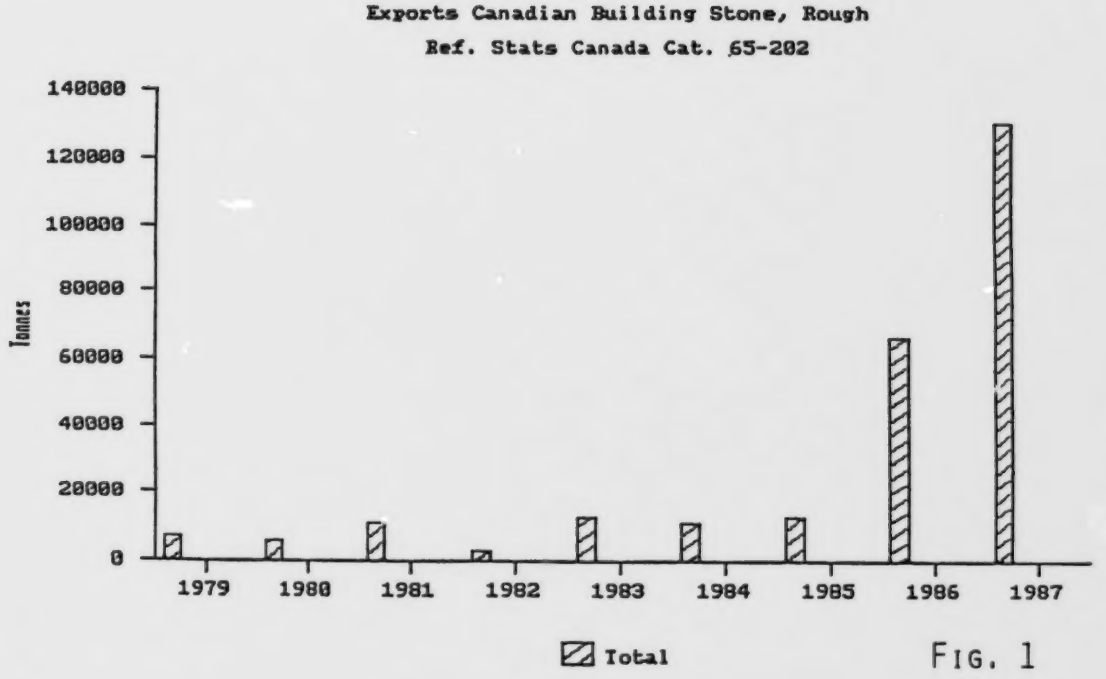

Exports Canadian Building Stone, Rough
Ref. Stats Canada Cat. 65-202
140000
120000
100000
80000
60000
40000
20000
0
Tonnes
1979
1980
1981
1982
1983
1984
1985
1986
1987
Total

FIG. 1

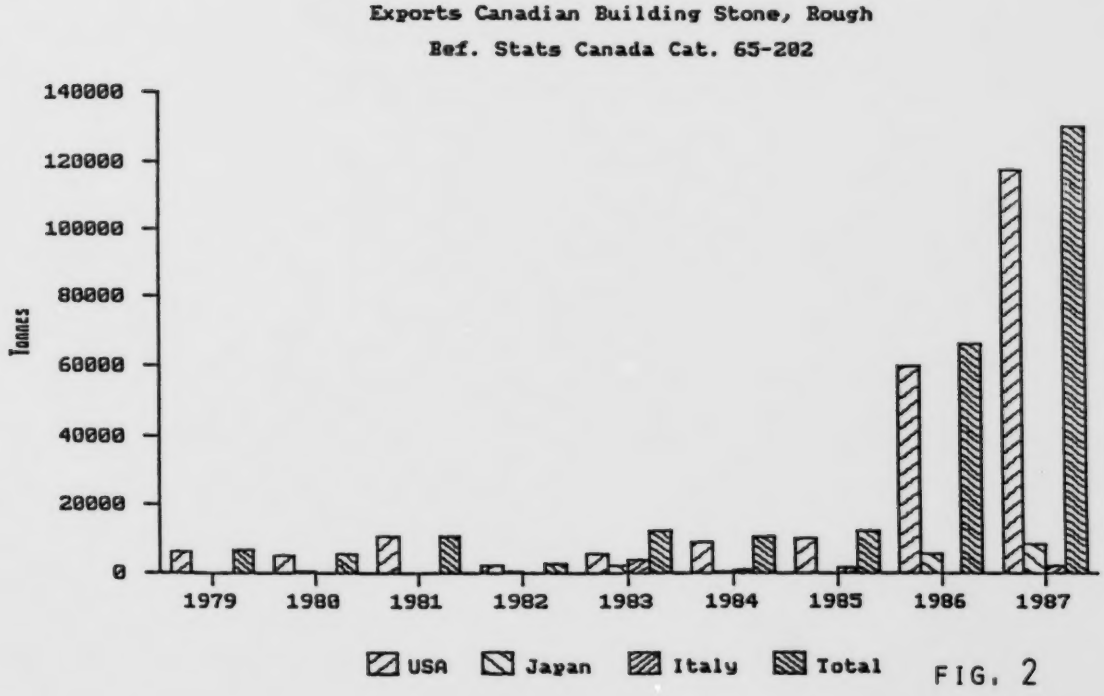

Exports Canadian Building Stone, Rough
Ref. Stats Canada Cat. 65-202
140000
120000
100000
80000
60000
40000
20000
0
Tonnes
1979
1980
1981
1982
1983
1984
1985
1986
1987
USA
Japan
Italy
Total

FIG. 2

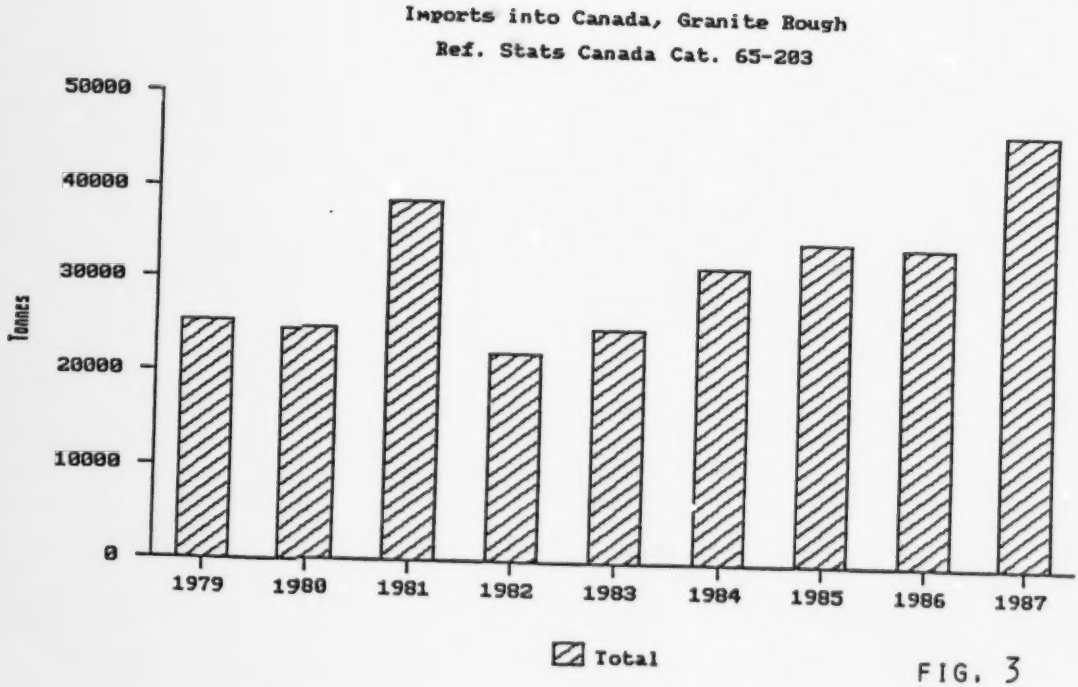

Imports into Canada, Granite Rough
Ref. Stats Canada Cat. 65-203
Tonnes
50000
40000
30000
20000
10000
0
1979
1980
1981
1982
1983
1984
1985
1986
1987
Total

FIG. 3

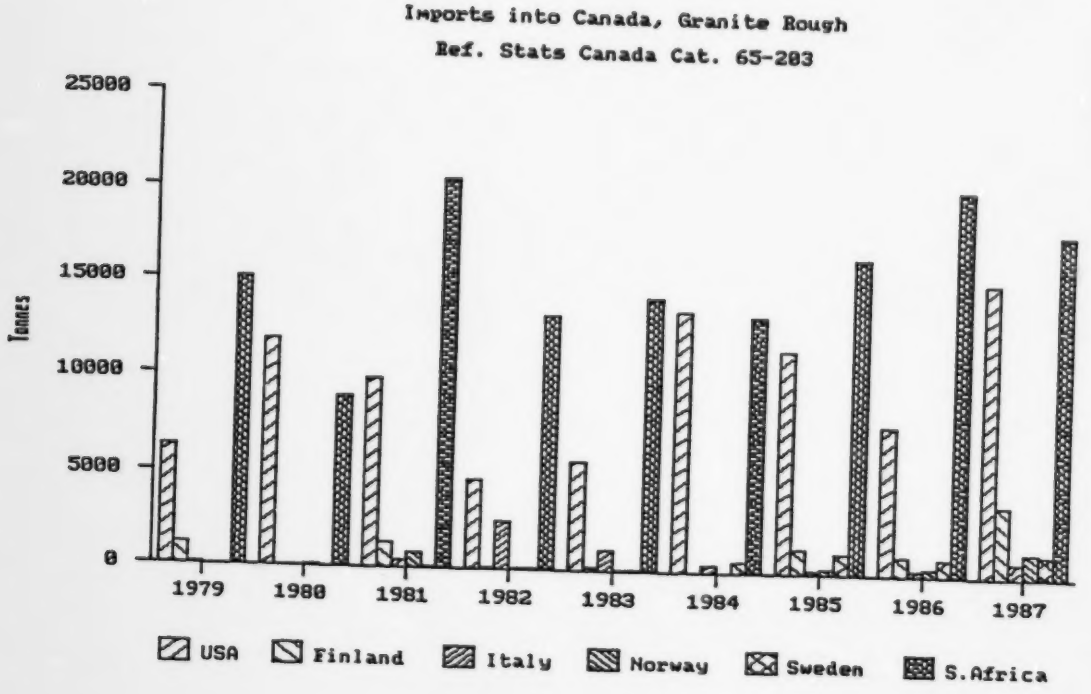

Imports into Canada, Granite Rough
Ref. Stats Canada Cat. 65-203
Tonnes
25000
20000
15000
10000
5000
0
1979
1980
1981
1982
1983
1984
1985
1986
1987
USA
Finland
Italy
Norway
Sweden
S.Africa

FIG. 4

LOCATION OF STUDY

The Sudbury Resident Geologist's District (see Figure 5, black line boundaries) extends northward from Lake Nipissing, French River and south of Manitoulin Island to approximately latitude 47°15'. The western boundary extends to approximately longitude 82°17', 21 km east of the Town of Elliot Lake. The eastern limit of the study area is step like and trends northwest from east of Lake Nipissing to the northeast corner of Canton Township.

The area is crossed by the Trans-Canada Highway (17) and major highways 69, 144, 64, and 6 with many secondary highways, regional roads, township roads and forest access roads.

The Canadian National and Canadian Pacific railroads also cross the area.

HISTORY

Presently production of dimension stone in the Sudbury District is limited to the River Valley area, approximately 70 km east of Sudbury, and within the Bell Lake granite 25 km northeast of Killarney.

Although dimension stone production is presently limited, local McKim Formation mudstone and Chelmsford Formation siltstone

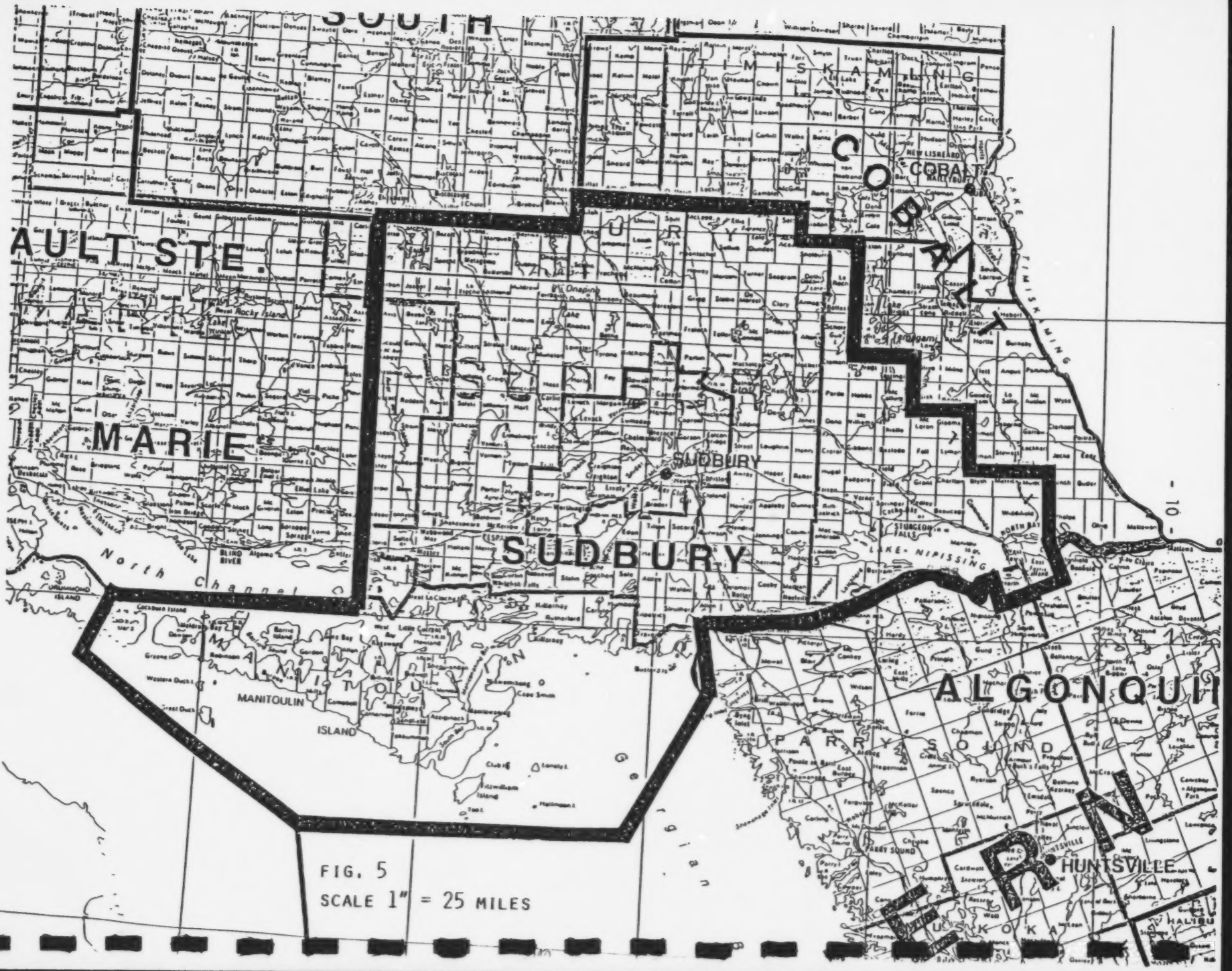


FIG. 5
SCALE 1" = 25 MILES

were used extensively on Sudbury area churches and prominent buildings in the early part of the century. Several of these small quarries can be still seen in downtown Sudbury and in Chelmsford.

Used primarly for construction blocks (20 x 20 x 35 cm) these sedimentary rocks were chosen for their proximity to construction sites and easy splitting characteristics. Prominent Sudbury buildings include the Bell mansion (built in 1906 of McKim Formation mudstone), St. Jean De Brébeuf Church built in 1910 and St. Joseph's Church built in 1930 (using Chelmsford Formation siltstone).

The River Valley area has been producing gabbroic anorthosite 'black granite' dimension stone intermittently since 1954. The Nipissing Black Granite Company was the first producer in the Sudbury area, operating a bench quarry in northern Gibbons and Crerar Township. The quarry produced a medium grained black anorthosite until 1959 when it was sold to the Industrial Garnet Company Ltd. Erana Mines Ltd. later bought out Industrial Garnet Company Ltd. The operation was then switched to producing variously sized crushed material for precast aggregate. Mid Canada Shield Ltd. purchased the quarry in 1980, and continued to produce crushed granite. Examples of Nipissing Black Granite can be seen in Toronto on subway station entrances, the Workman's Compensation Board building, and the National Trust Co. Building. (Vos, Smith, and Stevento, 1981).

Dana Black Granite Ltd. is the second past producer in the River Valley area. The quarry has produced black gabbroic anorthosite intermittently since 1977. Located in south-central Dana Township, the site has undergone extensive development with blocks being extracted from nine working faces. The granite was initially well received and sold well, but microfractures, noticable only after polishing, and occasional white lines and cloudy areas slowed sales of this product. It appears that the microfractures, rather than being inherent in the rock, were a result of poor blasting techniques. The quarry was recently sold to Canadian Shield Quarries Ltd.

Positano Granite (Poscan Ltd.) quarry a black and white gneissic variety of the River Valley Complex, located 17 km west of the Dana quarry in central Henry Township. At this location the anorthosite contains small amounts of sulphides. The quarry produces medium size dimension stone blocks for internal use as countertops, mantels, flooring tiles, etc.

Warren Industrial Feldspar Co. Ltd. originally developed the site in 1984.

Since 1954 many small scale producers have attempted quarry operations in the River Valley anorthosite and surrounding areas with limited success. Potential products ranged from roofing granules to curling stones. A good description of these small

producers can be found in OFR 5329 (Vos, Smith, and Stevento, 1981).

Canadian Unique Granite Ltd. are developing a feldspar porphyry within the Bell Lake granite, about 25 km northeast of Killarney. Evaluation of this property began in 1986 with stripping, diamond drilling and removal of test blocks. The "Killarney Tweed" is currently at a promotional stage. A small stock pile of medium sized blocks has been produced.

DIMENSION STONE ACTIVITY 1988

1988 proved to be an exciting year for the dimension stone industry in the Sudbury area.

Three quarries produced limited supplies of dimension stone in 1988. All sites are at a test-quarry promotional stage producing small stockpiles of medium sized blocks (approximately 1.3 x 1.3 x 2.1 m). Quarries include "Killarney Tweed" owned and operated by Canadian Unique Granite Ltd. of Sudbury, Ontario; "Positano Granite" owned and operated by Poscan Ltd. of Elmville, Ontario; and, "Dana Black Granite" owned by Vior Mining and Exploration Co. Inc. and operated by subsidiary, Canadian Shield Quarries Ltd. A full description of each site is given later in this report.

Sudbury Canadian Granite Inc. attempted to quarry a fine grained black gabbro which straddles Cadeau and Tennyson townships north of Massey, Ontario with limited success. Intensive fracturing made large block removal difficult.

Exploration for new deposits was active throughout most of 1988, with over 140 claims staked in the Sudbury area. Samples of several sites have undergone testing for A. S. T. M. characteristics and quarryability with promising results.

Manufacturing has also kept pace with recent exploration and development of building stone in the Sudbury area. Peter Ellero & Son Ltd. and Khouri Granite Ltd. are producing polished monuments, sills, and specialty products plus limited quantities of floor tile and granite veneer. Both plants are capable of processing 15 ton granite blocks with state of the art equipment.

ACKNOWLEDGMENTS

The author would like to thank the following people for contributions to this report:

Canada/Ontario Mineral Development Agreement for providing the funding for this project.

Rob Campbell, Staff Geologist, Ministry of Northern Development & Mines, Sudbury for providing valuable geological information on all sites discussed within this report.

Mike Grant for providing petrographic descriptions of selected sites.

Guy Hinse and Andy Durrant of Norgranite Ltd. for providing helpful information concerning their properties throughout the Sudbury Area.

Tracy Livingstone for typing this report.

Field assistance was provided by Miles Lamacraft under the Experience '88 program, and Richard Henri helped in preparing maps and polished slabs for display.

METHOD OF INVESTIGATION

The initial stage of this study consisted of reviewing available literature on granitic rocks potentially suited for building stone within the Sudbury Area. Several target areas were chosen based on previous descriptions by R. W. Campbell (1986, MNDM) and available geological reports and maps.

The study focussed on road outcrops and on traverses of less than 1 km from roads. Descriptions of each site include location, approximate percentage of outcrop, depth of overburden, fracture density and orientation, colour, texture and estimated mineral composition.

All present and past producing quarries were examined and sampled.

A representative sample from each site has been cut and polished for megascopic descriptions and polishing characteristics.

A polished sample of each site is on display at the Sudbury Resident Geologist's office.

CONCLUSIONS AND RECOMMENDATIONS

1988 proved to be a very successful year for the building stone industry in the Sudbury area. Three quarries produced limited supplies of dimension stone, and two granite manufacturing facilities were completed and became operational.

The exploration for new deposits also proved successful with approximately 140 claims staked and five sites (all within 90 km of Sudbury) being investigated for quarryability and A. S. T. M. characteristics.

If local deposits and prospects are further developed into full production, the Sudbury area with its well developed infrastructure and proximity to important markets in Southern Ontario and the northern United States could develop and support the new industry.

This report describes areas with moderate to high potential for possible dimension stone quarries. The highest potential areas are located in four main intrusive bodies. They include: Grenville Front plutons; Cosby Batholith; West Bay Batholith; and, River Valley Anorthosite (see inset map in rear pocket). Road access to the Cosby and West Bay batholiths is excellent. Many areas have moderate fracturing and are good exploration targets. The Grenville Front plutons and River Valley

anorthosite, which contain the three active quarries in the area, have good potential for new deposits of varying colour and composition.

Some reconnaissance work in the Archean granitic rocks north and west of the Sudbury Basin has uncovered only small isolated areas with moderate potential. 1989 field investigations will focus on this large area to assess its potential.

GRANITE STUDY AREAS

Name: Rutter Pluton

Colour: Orange-red/black

Fracture: Joint spacing is variable from 1 to 3 m, sheeting is not observed at this site but exposed ridges show that sheeting is greater than 1 m.

Texture: Gneissic

Location and Access:

The examined area is located 0.8 km west of Highway 69 at the village of Rutter. A good all season gravel road heads west from the intersection of Highway 69 and 64, and crosses the outcrop.

NTS: 41 I/12
Long: 80° 41' W Lat: 46° 06' N
UTM: 524500 E / 5105650 N
Township: Delamere, Lot 11, Con. I

Regional Geological Setting:

The Rutter Pluton is a narrow elongate body of gneissic diorite. The body intrudes metasedimentary gneisses of the Grenville Province, and is in fault contact with a large nepheline syenite complex, along its western margin.

Geology: The rock is a medium-grained orange to red/black gneissic diorite. A well exposed topographically flat area 150 x 70 m is strongly foliated with gneissic fabric striking at 150° and dipping to the east at 60°. Two prominent joint directions trend 300° with 4.0 m spacing and 230° with 3.0 m separation. Alternating discontinuous layers of felsic and mafic minerals average 3 mm in width and comprise 80% of the rock. Sub-parallel (medium-grained) granitic to pegmatitic layers ranging in width from 5 mm to 0.5 mm occur randomly throughout the outcrop and account for 20% of the rock.

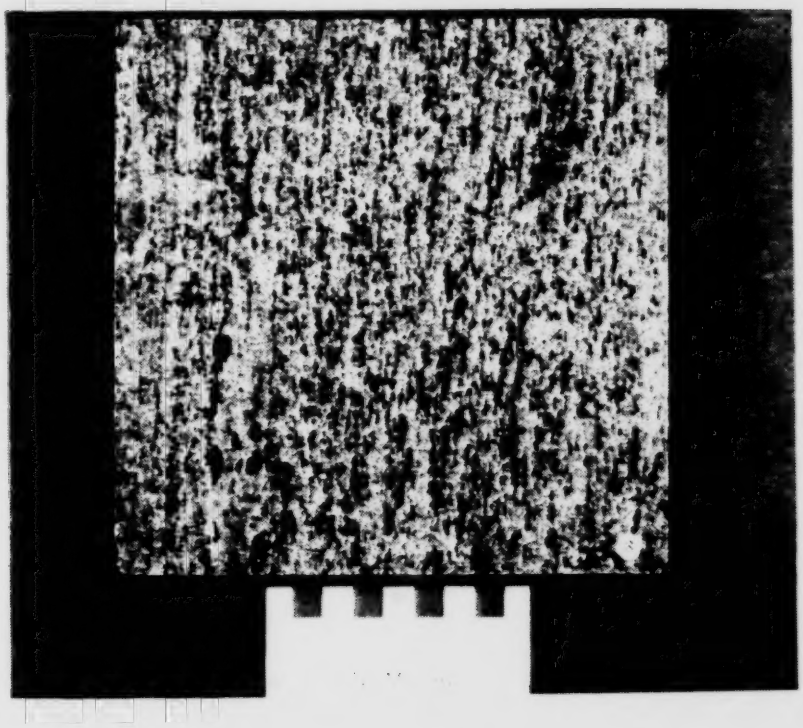
A random sample taken from the examined area polishes well. The rock is medium-grained with individual grains +/- 3 mm, increasing to 7.0 mm in pegmatitic sections. Plagioclase is cloudy, orange-red and comprises approximately 70% of the rock, 10% quartz is clear and colourless; 15% of the rock is hornblende and 5% is biotite.

History: No evidence of quarrying on this intrusion was found.

Land Status:
Crown land

References:

See reference (1), p. 95.



Rutter Pluton

Texture and grain size of polished slab.

I. Rutter Pluton

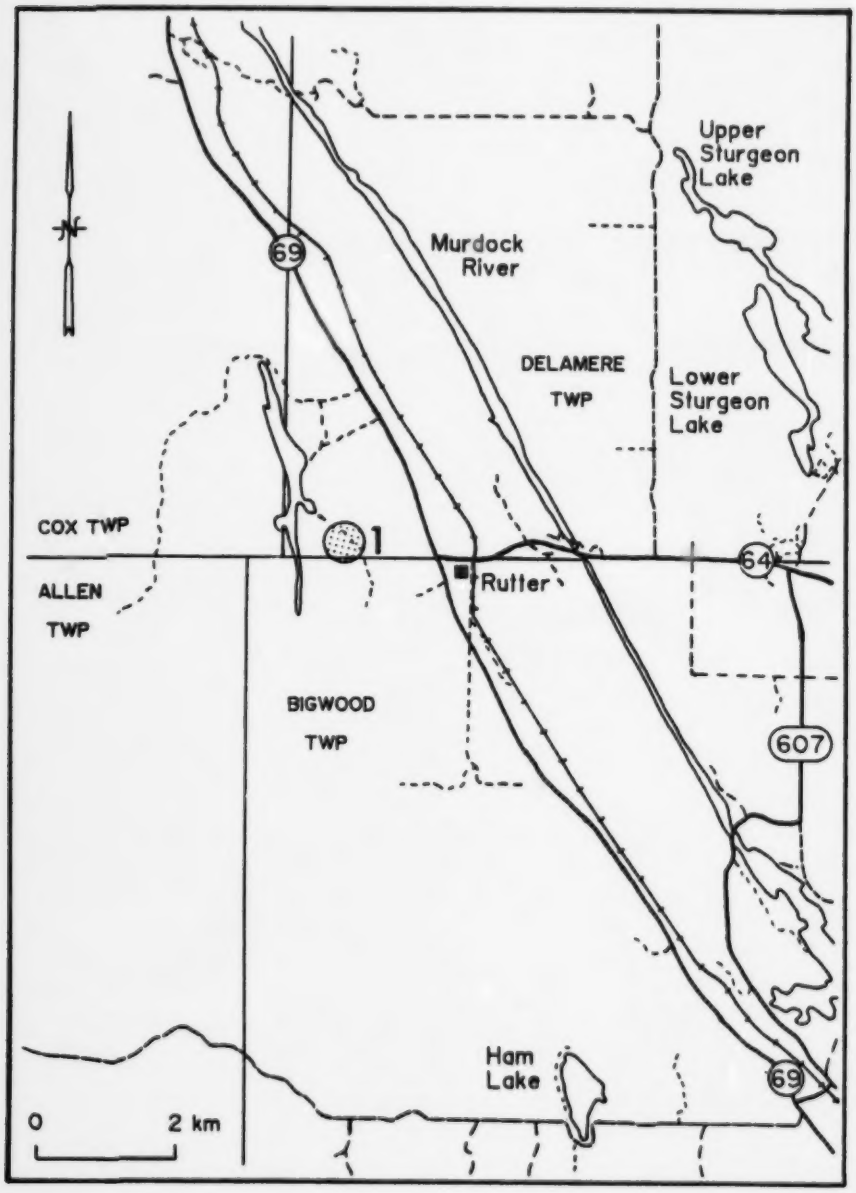


Figure 6

Name: St. Charles
Colour: White-pale blue/black
Fracture: Jointing at this site is >3 m with sheeting >1.5 m
Texture: Coarse-grained, porphyritic

Location and Access:

The St. Charles anorthosite is located 1 km south of the village of St. Charles.

NTS: 41 I/8
Long: 80°25' W Lat: 46°21' N
UTM: 545100 E / 5133200 N
Township: Casimir

Regional Geological Setting:

The area is underlain by anorthositic rocks of the St. Charles sill which intrude granitic and metasedimentary gneisses of the Grenville Province.

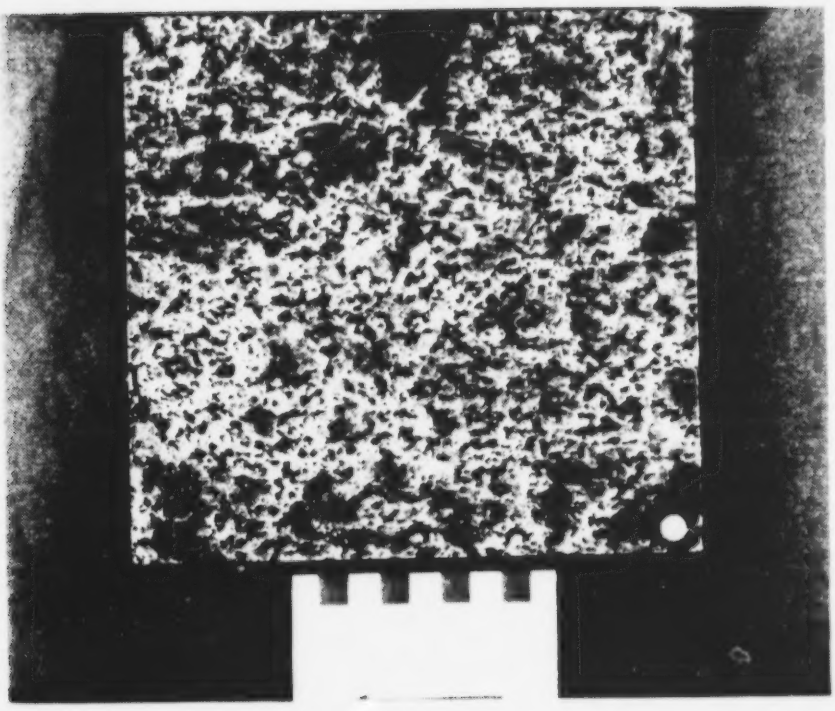
Geology: The St. Charles anorthosite is a narrow elongate body (8.8 km long and up to 0.8 km wide). This body is deformed and gneissic, except for a massive central core of coarse grained anorthosite (Lumbers, 1975). The central core forms a promiment well exposed ridge 150 x 90 m. Jointing is near vertical with spacing 3 m and greater. There are two predominant joint sets at 200° and 250°. Horizontal sheeting, though not exposed, is greater than 1.5 m.

The rock is medium to coarse-grained, porphyritic, white to gray blue, with spotty black mafic sections up to 1.5 cm across. Megacrysts of plagioclase up to 4.0 cm are randomly oriented and well twinned.

History: No evidence of quarrying was found on this intrusion. Norgranite Ltd. mapped the area and removed small blocks for testing in 1988. Results were not available at time of writing.

Land Status:
Norgranite Ltd. of Sudbury, Ontario is the registered owner.

References:
See reference (1), p. 97.



St. Charles

Texture and grain size of polished slab.

2. Saint Charles

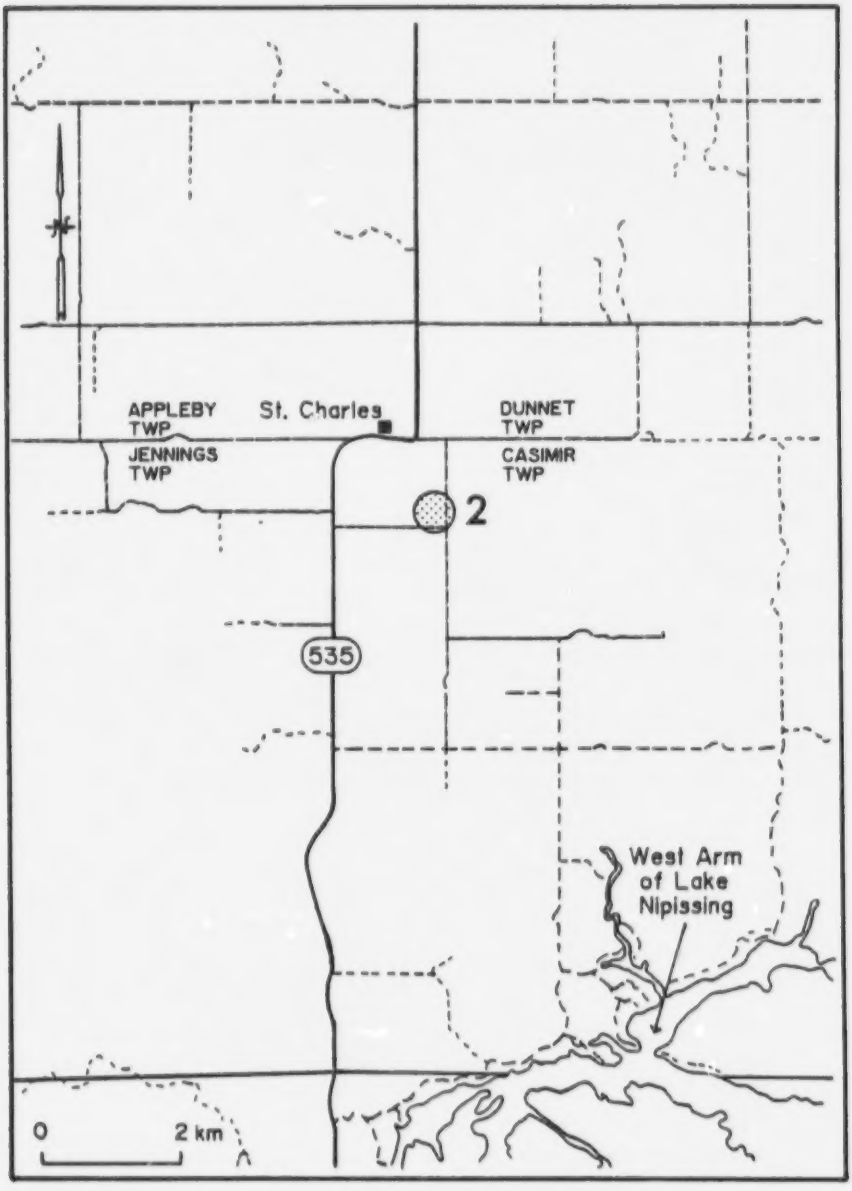


Figure 7

Name: Pure Lake Prospect
Colour: Medium brown to salmon pink
Fracture: Joints are spaced 2.0 m and greater, with sheeting not less than 1.2 m thick. Exposure of horizontal sheeting is limited due to flat lying topography
Texture: Massive to mottled

Location and Access:

The area is centered between Lac Barbotte and Lac Clair approximately 2.0 km north of the village of Jamot. An all season gravel road, heading north from Highway 64 at Jamot, crosses the examined area.

NTS: 41 I/2
Long: 80°33' W Lat: 46°09' N
UTM: 536800 E / 5104900 N
Township: Cosby

Regional Geological Setting:

The area is underlain by monzonitic to granitic rocks of the Cosby batholith which intrudes metasedimentary gneisses of the Grenville Province.

Geology: The Cosby Batholith at Pure Lake is medium brown to salmon pink. The batholith exhibits generally low relief with gently rolling northwest trending ridges. The exposed outcrops are massive to slightly foliated with a weak gneissic fabric striking at 270°. Jointing is moderately spaced with near vertical joints a minimum of 2.1 m apart. Two prominent joint systems strike 280° and 193°. These are well defined, and continuous up to 70 m. Narrow discontinuous en echelon fracture zones occur randomly throughout the examined area.

A representative sample taken from the area has been examined. The cut slab polishes well, revealing a massive hypidiomorphic texture. Mineral content is approximately 50% albite, 8% oligoclase, 20% orthoclase, 10% quartz, 10% hornblende, 2% biotite with accessory clinozoisite and zircon.

History: Norgranite Ltd. mapped the 60 claim group in July-August 1988. Test blocks were later removed from four sites with the following A.S.T.M. results:

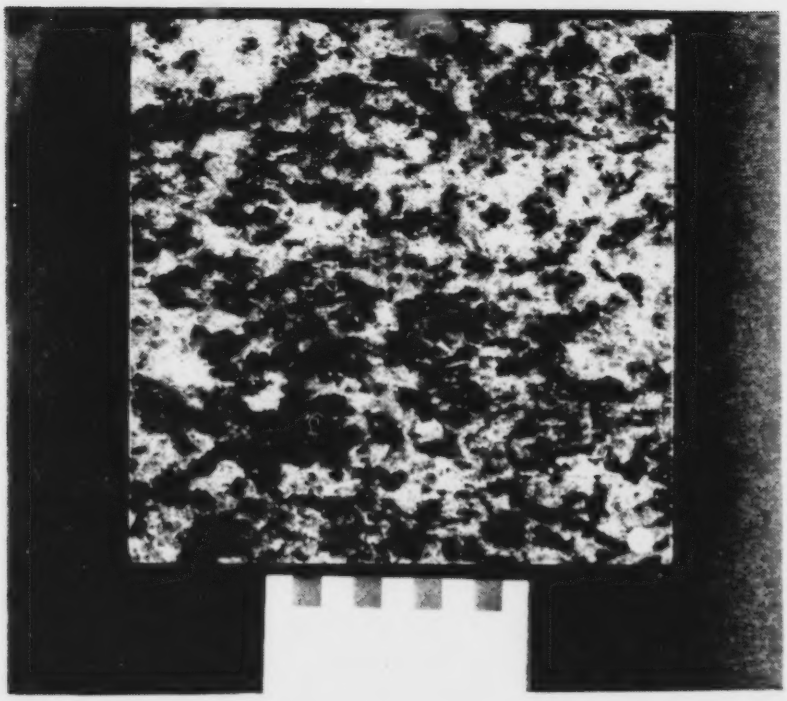
Absorption	16%
Compressive Strength	3000psi
Modules of Rupture	17.92 MP(a)
Abrasion	5876

Land Status:

Staked by Norgranite Ltd. in 1988.

References:

See reference (1), p. 96.



Pure Lake Prospect

Texture and grain size of polished slab.

Name: Chartrand Farm Prospect
Colour: Salmon and black
Fracture: Joint spacing at this site is variable. Average separation is 2 m, with many short discontinuous en echelon fractures 40-50 cm long occurring randomly throughout the examined area
Texture: Gneissic

Location and Access:

The examined area is located 3 km north and 0.75 km east from the village of Ouellette. Access is via gravel roads leading north from the village of Ouellette and Highway 64.

NTS: 41 I/1
Long: 80°29′ W Lat: 46°08′ N
UTM: 536800 E / 5104900 N
Township: Cosby

Regional Geological Setting:

The area is underlain by monzonitic to granitic rocks of the Cosby batholith, which intrude metasedimentary gneisses of the Grenville Province.

Geology: The rock is a highly contorted gneiss with light orange to salmon coloured augens or phenocrysts of plagioclase in a black clotty ground mass of biotite (12-15%) and hornblende (5-15%). The plagioclase augens comprise 70% of the rock and may reach 5 cm in width.

The rock is well exposed and weathers a pale pink to cream. The examined area has low relief with thin overburden. Sheeting is not exposed. Two main joint directions are 350° and 260°, with variable spacing, most are 2.2 m apart but short discontinuous, en-echelon fracture sets have 30-50 cm spacing.

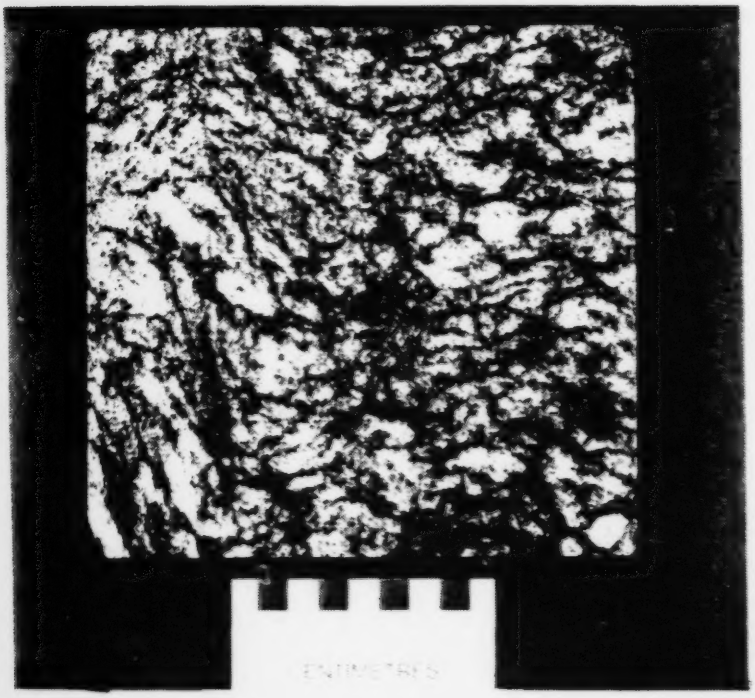
History: Norgranite Ltd. mapped several sites on the property for fracture density and removed sample blocks in 1988. No test results were available at time of writing.

Land Status:

Patented land owned by Norgranite Ltd.

References:

See reference (1).



Chartrand Farm Prospect

Texture and grain size of polished slab.

Name: Ouellette Oak Tree Showing
Colour: Medium brown
Fracture: Joints are spaced 3-7 m, sheeting is not exposed at this location
Texture: Massive, slightly porphyritic

Location and Access:

The area is crossed by an all season gravel road, 1 km south of the village of Ouellette and Highway 64.

NTS: 41 I/1
Long: 80°30' W Lat: 46°06' N
UTM: 538750 E / 5104800 N
Township: Cosby

Regional Geological Setting:

The area is underlain by monzonitic to granitic rocks of the Cosby batholith, which intrudes feldspathic to micaceous metasedimentary gneisses of the Grenville Province.

Geology: The area examined is about 100m across, with good exposure of approximately 65%. The massive coarse-grained monzonite is orange brown in colour and has a slightly porphyritic texture. Individual orthoclase crystals (up to 2.5 cm) are clear to cloudy, anhedral in shape and show poor twinning. The ground mass is a mixture of fine to medium-grained orthoclase, plagioclase, hornblende, and biotite. The ground mass occurs as fine-grained clotty masses of mafic minerals, and sugary textured orthoclase, microcline, and quartz, surrounding the larger orthoclase crystals.

Fracturing is greater than 2.7 m with a prominent near vertical joint set at 240°. A narrow shear zone 1.5 m wide cuts through the centre of the outcrop at 250° with sharp contacts and limited alteration.

While the size of this deposit is uncertain, texture variations were noted to the south and east within 300 m. North and south of the outcrop area, overburden increases.

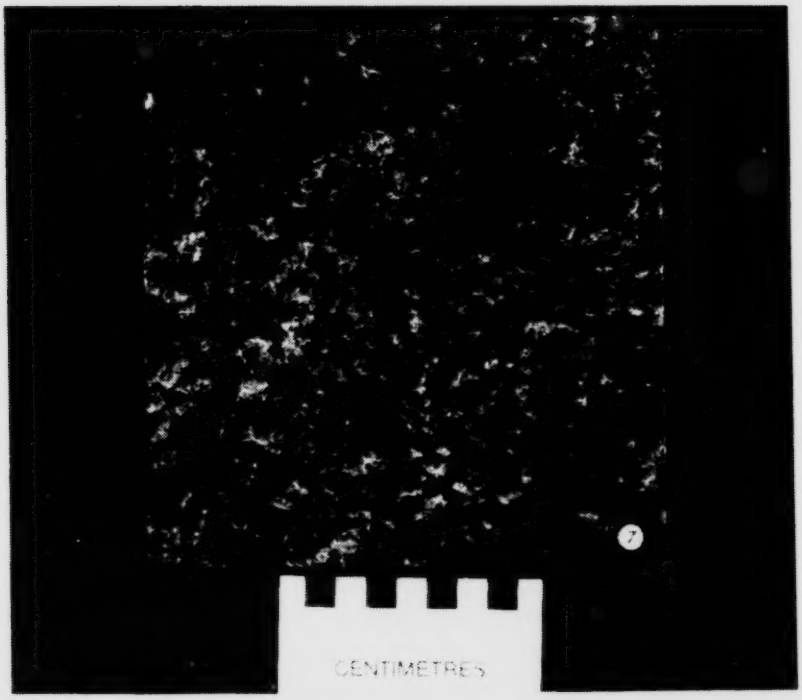
History: No history of quarrying this rock has been recorded.

Land Status:

Patented farm land.

References:

See reference (1), p. 96



Ouellette Oak Tree Showing

Texture and grain size of polished slab.

3. Pure Lake
4. Chartrand Farm
5. Oak Tree

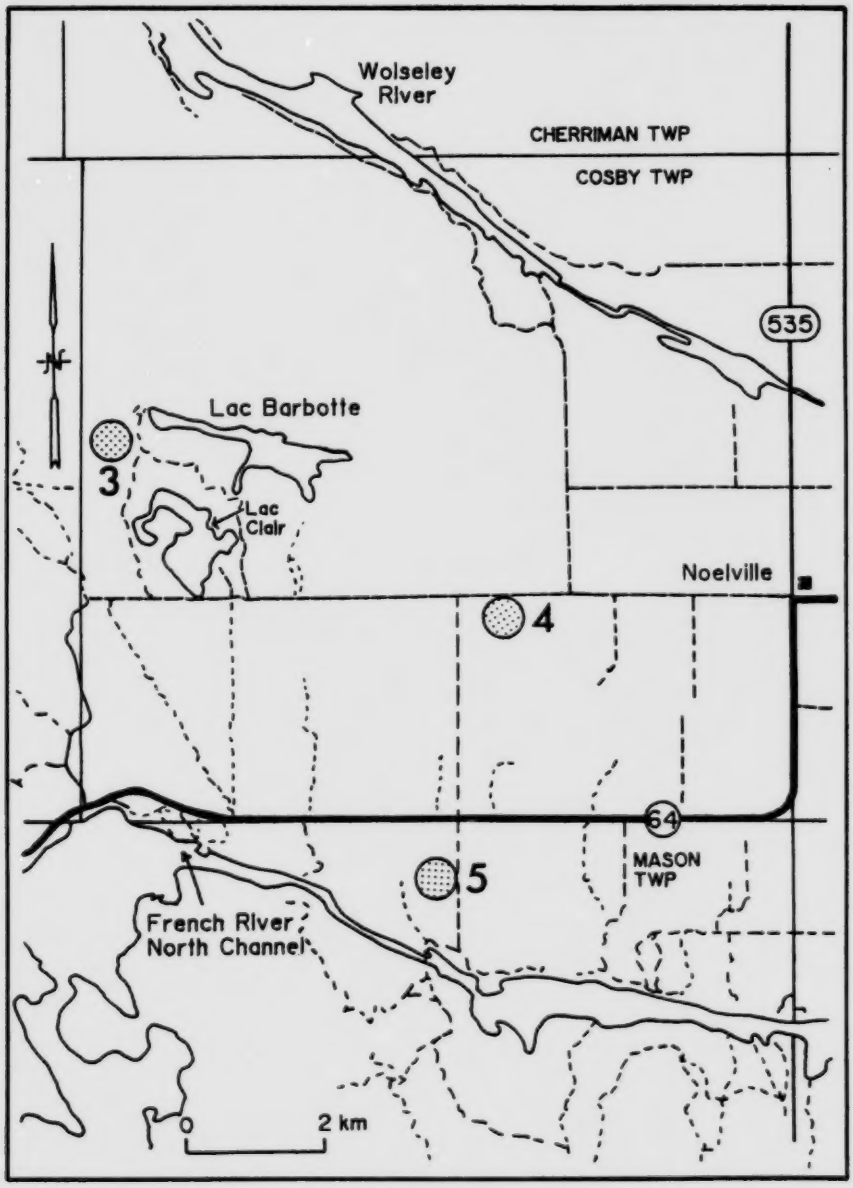


Figure 8

Name: Servos Pluton
Colour: Black with light blue to gray
Fracture: Joint spacing is 0.7 to 2.5 m with sheeting 1.2 m and greater
Texture: Gneissic

Location and Access:

The Servos pluton occurs at the junction of Highway 69 and Highway 673 (the Killarney Road). The area examined is north of Highway 673 and southwest of Highway 69.

NTS: 41 I/2
Long: 80°47′ W Lat: 46°13′ N
UTM: 516400 E / 5118500 N
Township: Servos

Regional Geological Setting:

The pluton is an elliptically shaped body 2.3 x 1.4 km consisting mainly of gneissic tonalite and minor gneissic diorite. The body intrudes metasedimentary gneisses of the Grenville Province.

Geology: The rock is a black/light blue-gray gneissic tonalite. Well exposed east-west ridges rise 2.5 m above the surrounding topography in near vertical cliff faces. Main joint systems strike 273° and 170° and dip 70°N and 70°E respectively. Spacing between joints ranges from 0.7 to 2.5 m. Sheeting dips gently north, and is 1.2 m thick or greater.

The rock contains 30% mafic minerals consisting of a 2:1 ratio of hornblende to biotite. The felsic component is 50% plagioclase (An_{28}) and 20% orthoclase and minor quartz.

Moderate fracturing in the areas examined may not allow for large dimension blocks, but the rock polishes well, and is easily accessible.

History: No evidence of quarrying was found at this site.

Land Status:

Patented land, withdrawn from staking, part of the Burwash prison farm property.

References:

See reference (1).

<u>Servos Pluton</u>

View of outcrop area. Note thin overburden and moderate jointing.

Servos Pluton

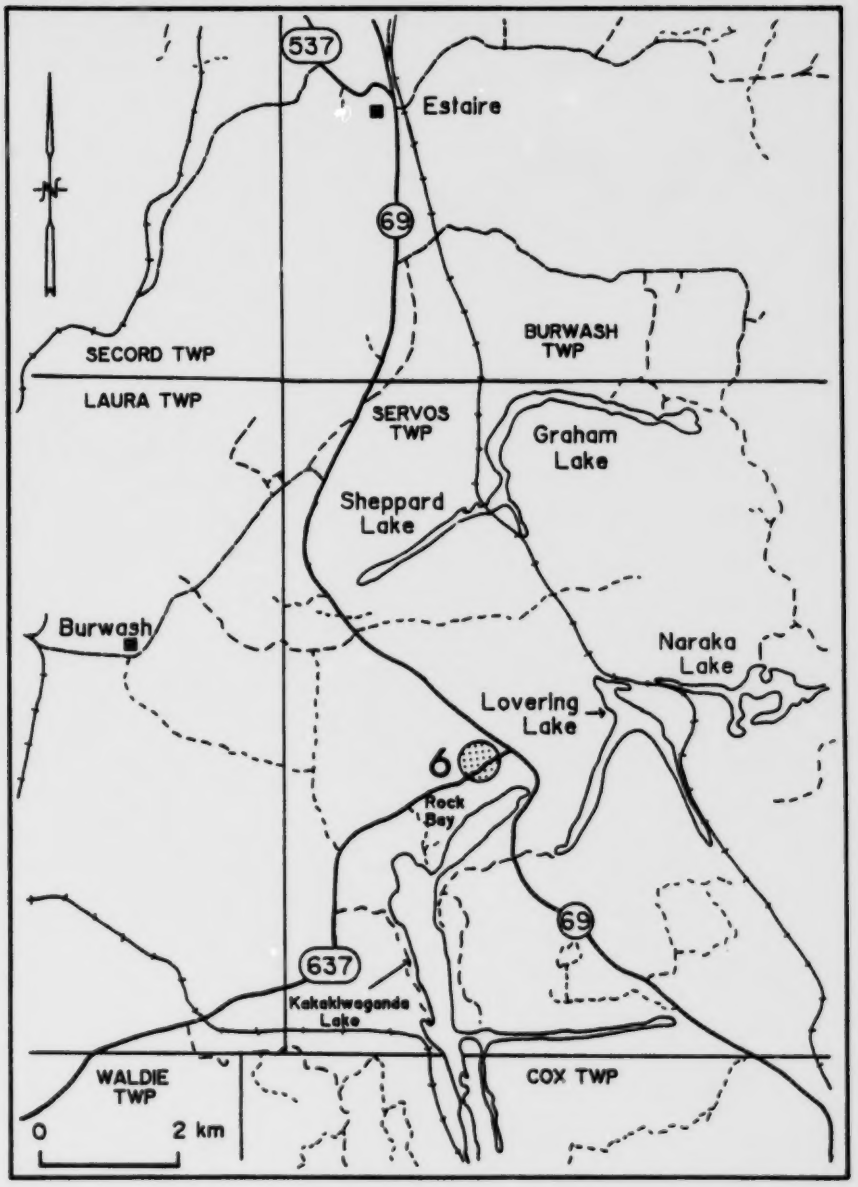


Figure 9

Name: Killarney Tent Zone
Colour: Pink/black
Fracture: Joints are spaced 1.0 to 2.0 m apart, with no exposed sheeting
Texture: Massive - slightly foliated

Location and Access:

The property is located along a forest access road 1 km north of the fork to Bell Lake. The Bell Lake road leads north from Highway 637, 16 km northwest of Killarney.

NTS: 41 I/3
Long: 81°12' W Lat: 46°07' N
UTM: 484400 E / 5107000 N
Township: Goschen

Regional Geological Setting:

The area is underlain by granitic to quartz monzonitic rocks of the Killarney granite.

Geology: The Killarney Tent Zone is a pink/black/gray granite to quartz monzonite. Texture is massive to slightly foliated with grain size varying 2 mm to 2 cm. A good exposure 40m across shows slight variations in colour and texture.

A prominent parallel joint set strikes at 240° with joint separation of 1.4 m. A second set of discontinuous joints strikes at 130° with 2.5 m spacing or greater. Horizontal sheeting is not exposed due to flat lying topography, but a thin sheet 10 cm thick appears to cap most of the outcrop. This cap makes it difficult to properly evaluate the joint spacing and texture.

A representative sample from the site took a high polish. The rock has a spotty appearance. Creamy pink anhedral grains of microcline (1 cm) comprise 30% of the rock. Plagioclase (25%) occurs as cloudy white to gray subhedral equigranular grains 3-5 mm in size. Quartz grains, 2-4 mm, are clear and colourless. Mafic minerals hornblende (10%) and biotite (8%) are aligned subparallel to give a slightly gneissic appearance. Clotty areas up to 1 cm in length comprise 15-28% of the rock.

History: Norgranite Co. Ltd. mapped the property in

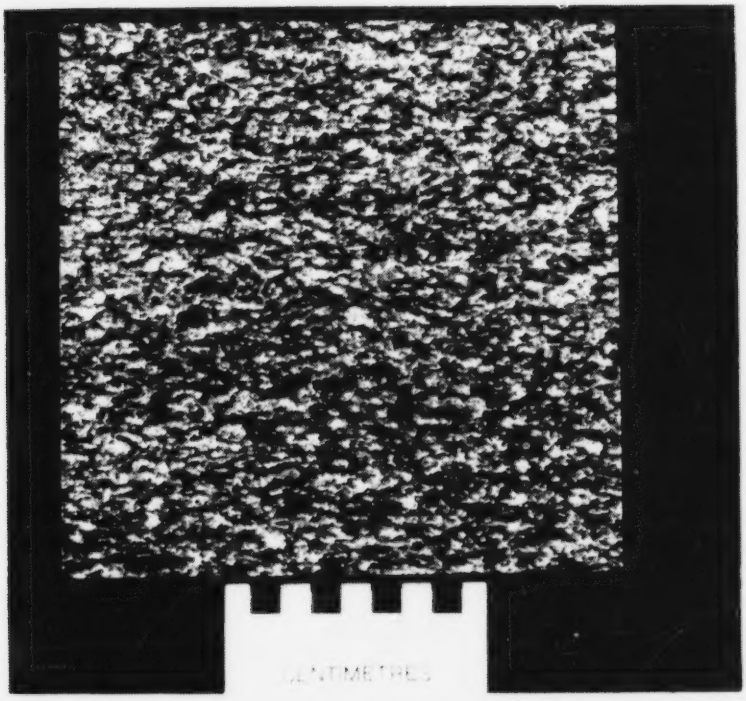
detail in July, 1988.

Land Status:

Staked by Norgranite Co. Ltd. in 1988.

References:

See Reference (2), p. 153.



Killarney Tent Zone

Texture and grain size of polished slab.

Name: Killarney Tweed
Colour: Black/gray matrix with pink phenocrysts
Fracture: Joints are spaced 1.5 m apart and greater. Sheeting is 1.5 m thick and increases with depth
Texture: Porphyritic

Location and Access:

The quarry is located in the southeast corner of Goschen Township, approximately 36 km northeast of the village of Killarney. The Bell Lake access road comes to within 2 km of the site. A forest access extension road forks from Bell Lake road and crosses the main stripped area 1.6 km north of the junction.

NTS: 41 I/3
Long: 81°10′ W Lat: 46°08′ N
UTM: 484540 E / 5107120 N
Township: Goschen

Regional Geological Setting:

Killarney Tweed is a coarse-grained porphyritic phase of the Bell Lake pluton. This is part of a large complex that extends along the Grenville Front Tectonic Zone south of Sudbury for 85 km and is up to 8 km wide.

Geology: The granite is a uniform coarse grained quartz monzonite orthoclase porphyry. Creamy pink phenocrysts of microcline form stubby euhedral laths averaging 2.5 cm in length and 7 mm in width. The groundmass is multicoloured with equal proportions of black, white and gray, subhedral, to anhedral grains (2 to 6 mm) of microcline and mafic minerals (hornblende and biotite). The ratio of phenocrysts to matrix is 1:3.

Structurally the rock is massive with phenocrysts forming a slight lineation trending 300°. Two prominent near vertical joint sets strike at 300° and 195° with separation ranging from 2.0 to 3.2 m. Drill holes indicate horizontal sheeting at 1.0 m to greater than 3.0 m.

Stripping in 1985 has exposed a gently rolling hill sloping gently north over an area of 60 x 60 m. The examined outcrop

shows several narrow felsic dykes 5 - 15 cm wide occuring at random orientations. Biotite rich "football" shaped xenoliths (5 to 40 cm) occur sporadically throughout the area.

A. S. T. M. TESTING

Absorbtion (Average)	0.14
Bulk specific gravity	168 lbs/cu. ft.
Modulus of Rupture (Average)	1887.5 p.s.i.
Compression (Average)	17400 p.s.i.

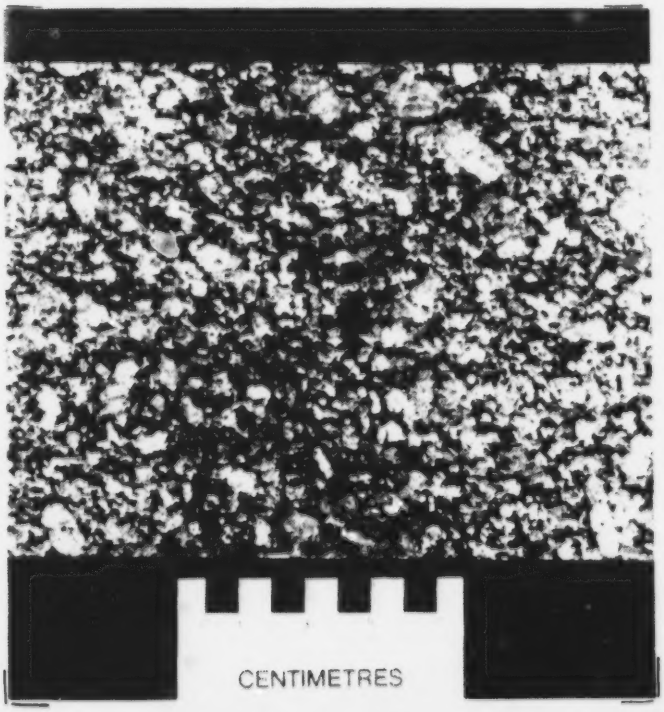
History: Canadian Unique Granite Ltd. began evaluation of the property in 1985 with stripping overburden, detailed fracture mapping and diamond drilling to test horizontal sheeting. Since that time several test blocks have been removed to produce promotional tiles. The quarry operated intermittently throughout 1988 to produce a small stockpile of medium size blocks (1.4 x 1.3 x 2.1 m).

Land Status:

Quarry permit.

References:

See reference (1).



Killarney Tweed

Texture and grain size of polished slab.

7. Killarney Tent Zone
Killarney Tweed (producer)

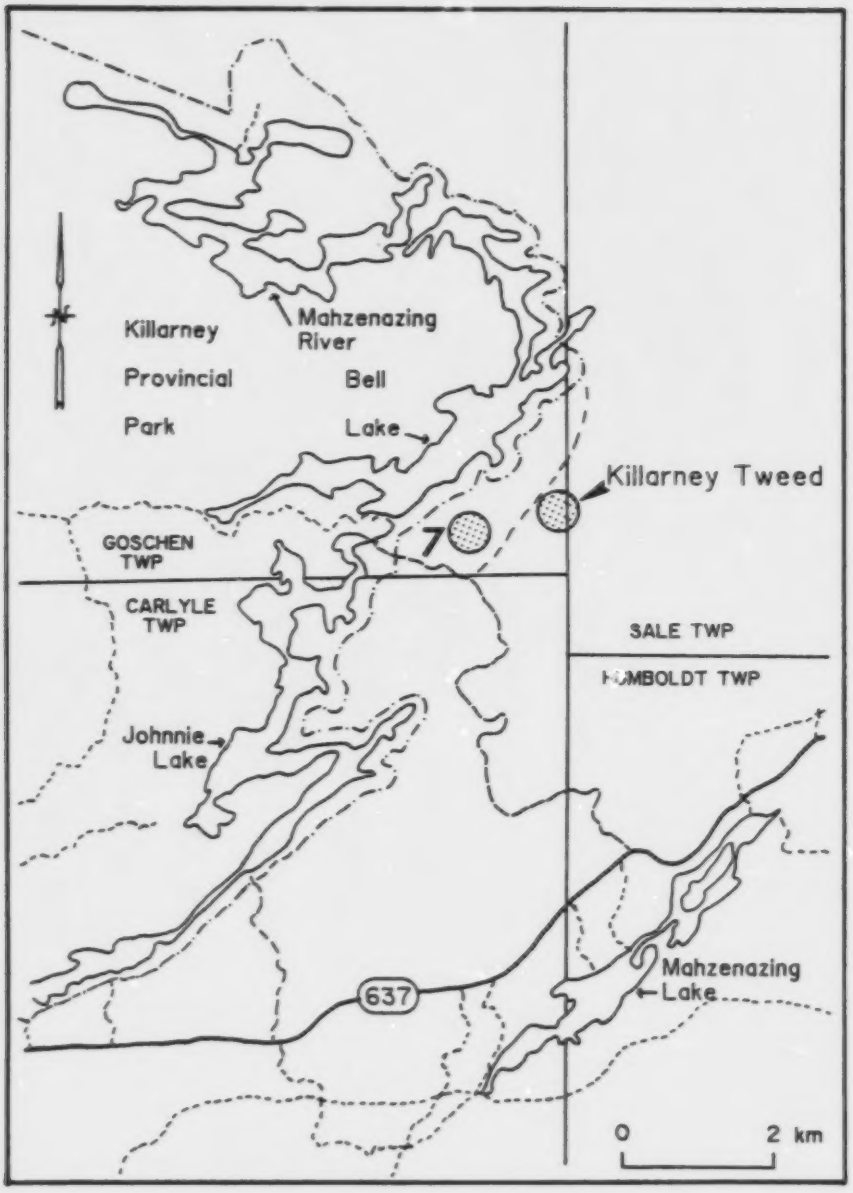


Figure 10

Name: Dana Black Granite
Colour: Black to dark green
Fracture: 1.25 m or greater
Texture: Massive coarse-grained equigranular

Location and Access:

The quarry is located 1.5 km north of Highway 805, 3.0 km east of Azen station on the Canadian National Railroad and 5.5 km west of the village of River Valley.

NTS: 41 I/9
Long: 80°14' W Lat: 46°38' N
UTM: 558550 E / 5165000 N
Township: Dana

Regional Geological Setting:

The area is underlain by black to dark green coarse grained gabbroic anorthosite of the River Valley anorthosite complex, covering approximately 75 km^2. The body is roughly elliptical in shape with narrow (0.5 - 3 km wide) finger like extensions stretching 25 km to the southwest. Most of this large complex intrudes metasedimentary gneisses of the Grenville Province. A portion intrudes metasediments of the Huronian Supergroup, Nipissing diabase and granophyre of the Superior Province (Lumbers 71, p. 92).

Geology: The black anorthosite is massive equigranular holocrystalline medium to coarse grained (4 to 5 mm). The rock is comprised of 90% bytownite plagioclase, 8% hypersthene and 2% augite. Vertical jointing is spaced 1.25 m or greater. (Vos, Smith, and Stevenato, 1981).

Throughout the exposed quarry faces white veinlets and cloudy patches of interstitial natrolite and prehnite occur randomly. The near vertical veinlets which pinch and swell may reach widths of 2.5 cm. The cloudy areas may reach 1 m in diameter and comprise up to 15% of the rock within these areas.

ASTM TESTING

Average, Compressive strength	23,759 p.s.i.
Absorption	0.15%
Abrasive Hardness	87.4
Bulk specific Gravity	3.01

Weight per cubic foot 187 lbs

History: The quarry has been producing granite for Building Stone and monuments intermittently since 1977. Mr. Claude Larcher sold the quarry to Canadian Shield Quarries, a subsidiary of Vior Mining and Exploration Co. Inc. in March 1989. Canadian Shield Quaries plans to produce "A" and "B" quality stone for construction veneer and monuments. The "A" stone will be medium grained equigranular with no white blemishes or veins. The "B" quality stone will be sold as is, with a small percentage of fine veinlets and cloudy white areas.

Land Status:

Quarry permit.

References:

See reference (4, 7, 10, 11).

Dana Black Granite

Quarry blocks at previous working area.

Dana Black Granite (producer)
Nipissing Black Granite, Erana Mines Ltd.
(past producer, see p. 10)

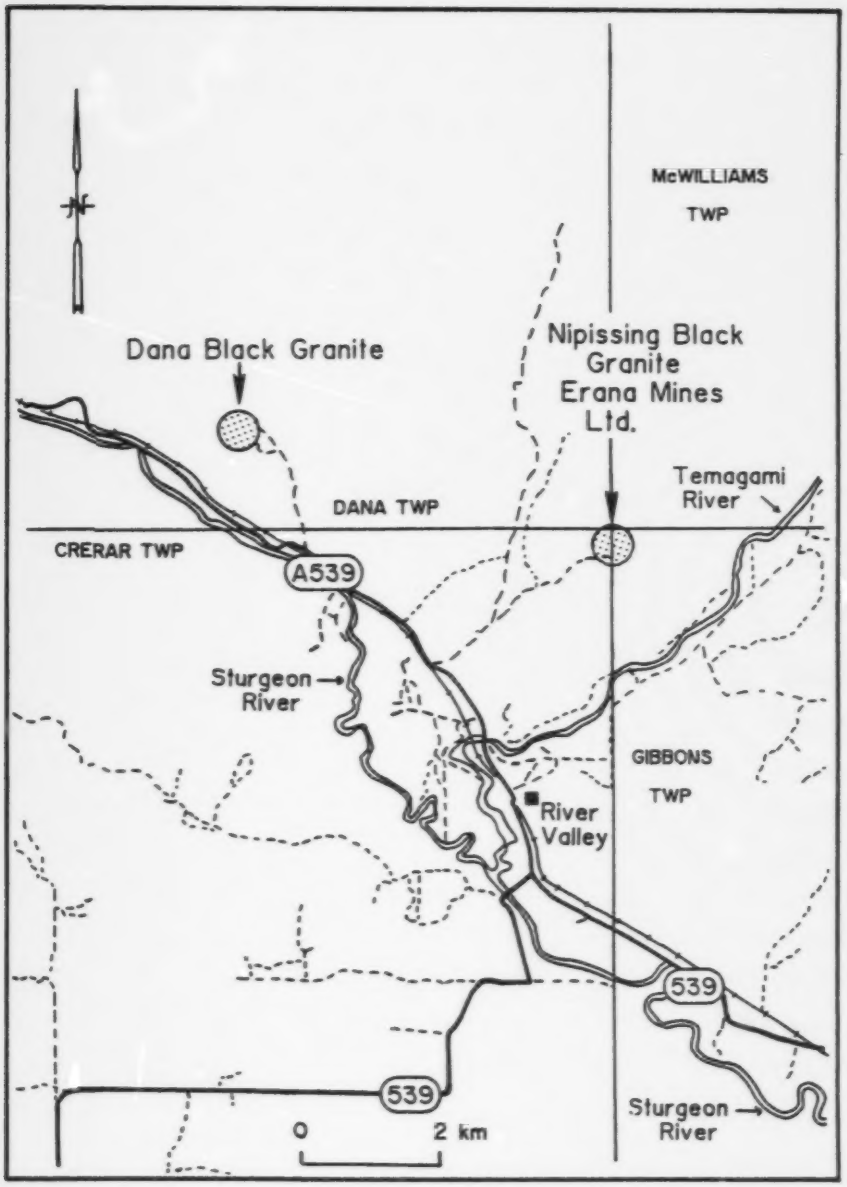


Figure II

Name: West Bay Duck Creek
Colour: Orange brown to pink purple
Fracture: Joints are spaced 2 to 3 m, sheeting is not exposed but is greater than 1.5 m.
Texture: Migmatitic-gneissic

Location and Access:

The area can be reached by gravel roads leading south and east from Highway 64, south of the village of Lavigne

NTS: 41 I/8
Long: 80°13′ W Lat: 46°17′ N
UTM: 560100 E / 5125200 N
Township: Macpherson

Regional Geological Setting:

The area is underlain by migmatitic and gneissic quartz monzonite rocks of the West Bay Batholith. This large granitic body (approximately 60km^2) is complexly deformed and intensely recrystalized suggesting early emplacement, before the anorthosite suite of intrusive rocks. (Lumbers, 1975)

Geology: The prospect is a well exposed ridge (120 x 60 m) which trends northwest, along the south shore of Duck Creek. The rock is pink/purple with a highly contorted gneissic texture striking at 300°. Two predominant joint sets trend 260° and 110° with observed spacing 2 m to 15 m apart. The sheeting is 1.5 metres thick.

Medium to fine-grained, with quartz and feldspar comprising 65% of the rock. Hornblende (10%) and biotite (5%) are thin and discontinuous, forming alternating black layers. Granitic and pegmatitic zones vary in width from 2.5 cm to 1.5 m and form 25% to 30% of the rock.

History: No evidence of quarrying was found at this site.

Several small quarries located throughout the West Bay Batholith have been used for construction blocks and crushed material for road fill. Large churches in Noelville and Verner and several farm houses in the area, dating from before 1930, are made from "plug and feather" blocks (15 x 30 x 35 cm) of

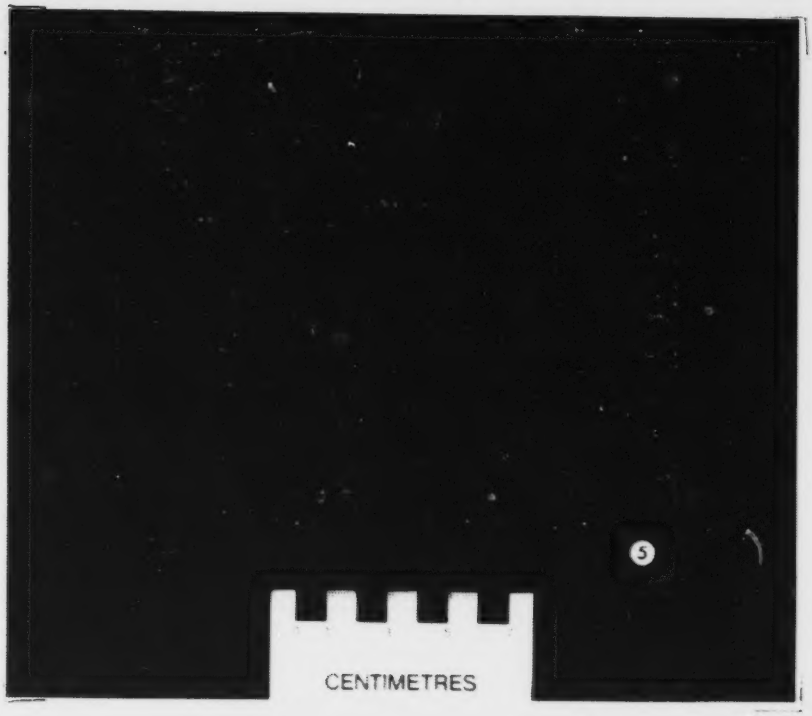
granite from the West Bay Batholith and occasional field stones. No attempts have been made to date to remove large blocks for building stone.

Land Status:

Patented land.

References:

See reference (5, 6).



West Bay Duck Creek

Texture and grain size of polished slab.

Name: Musky Island Road Prospect
Colour: Pink/purple
Fracture: Joints are spaced 1.6 m apart and greater. Horizontal sheeting is 1.6 m thick.
Texture: Gneissic

Location and Access:

The area is located immediately southeast of the intersection of Musky Island Road and Highway 64.

NTS: 41 I/8
Long: 80°19' W Lat: 46°16' N
UTM: 553600 E / 5123600 N
Township: Loudon

Regional Geological Setting:

The area is underlain by migmatitic and gneissic rocks of the West Bay batholith.

Geology: The rock here is similar to that described from the "Duck Creek prospect". The Musky Island prospect is a highly contorted gneissic quartz monzonite. The fabric strikes at 50° and dips 50°NE. The rock forms smooth gently rolling northeast trending ridges for an area of 120 x 60 m. Vertical joint sets at 280° and 340° are well defined and are continuous throughout the examined area with spacing at 1.2 to 2.7 m. A third set occurs as narrow zones of short discontinuous joints spaced 3 to 5.5 m apart.

A representative sample from this site takes a high polish with no visible "plucking".

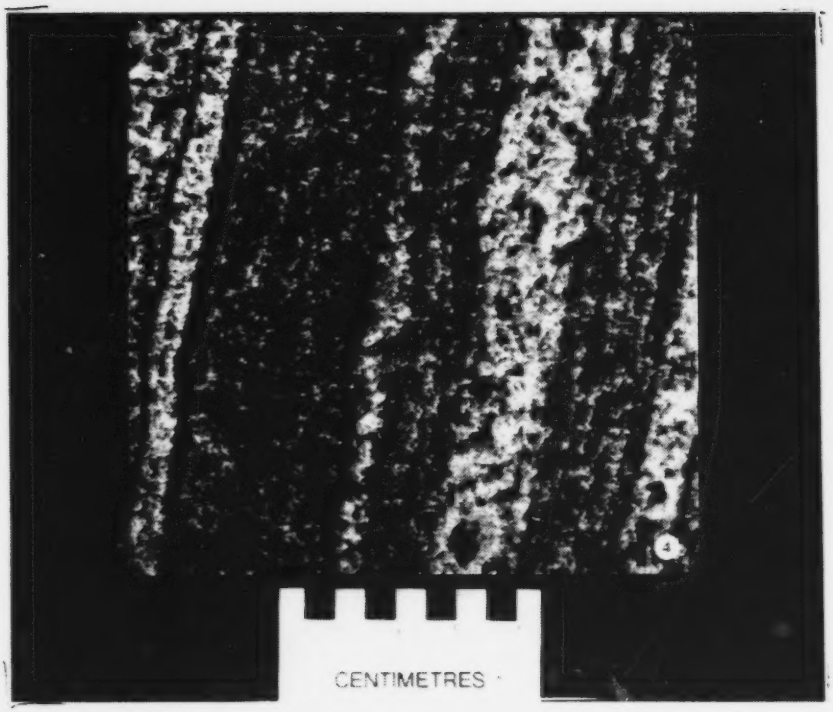
History: No evidence of quarrying was found at this site.
*See "Duck Creek Prospect", p. 41.

Land Status:

Patented land.

References:

See reference (5, 6).



Musky Island Road Prospect

Texture and grain size of polished slab.

Name: West Bay South
Colour: Orange brown to pink
Fracture: Joints are spaced 1.0 to 3 m, with undetermined sheeting
Texture: Variable, migmatitic to gneissic

Location and Access:

Northcentral Loudon Township, 0.6 km east of the south end of Duck Creek Road

NTS: 41 I/8
Long: 80°11' W Lat: 46°16' N
UTM: 562100 E / 5123200 N
Township: Loudon

Regional Geological Setting:

The area is underlain by migmatitic and gneissic rocks of the West Bay Batholith.

Geology: The rock here is similar to that described from the "Duck Creek prospect".

Gneissic quartz monzonite is exposed on a prominent east-west ridge approximately 100 x 60 m. The ridge has moderate joint spacing ranging from 1.9 to 3 m in two prominent directions at 280° and 080°, with undetermined sheeting. Colour ranges from orange brown to pink within a well developed gneissic texture striking at 300° and dipping at 50° NE.

History: No evidence of quarrying was found at this site.
*See "Duck Creek Prospect", p. 41.

Land Status:

Patented land.

References:

See reference (5, 6).

8. Duck Creek
9. Musky Island Road
10. West Bay South

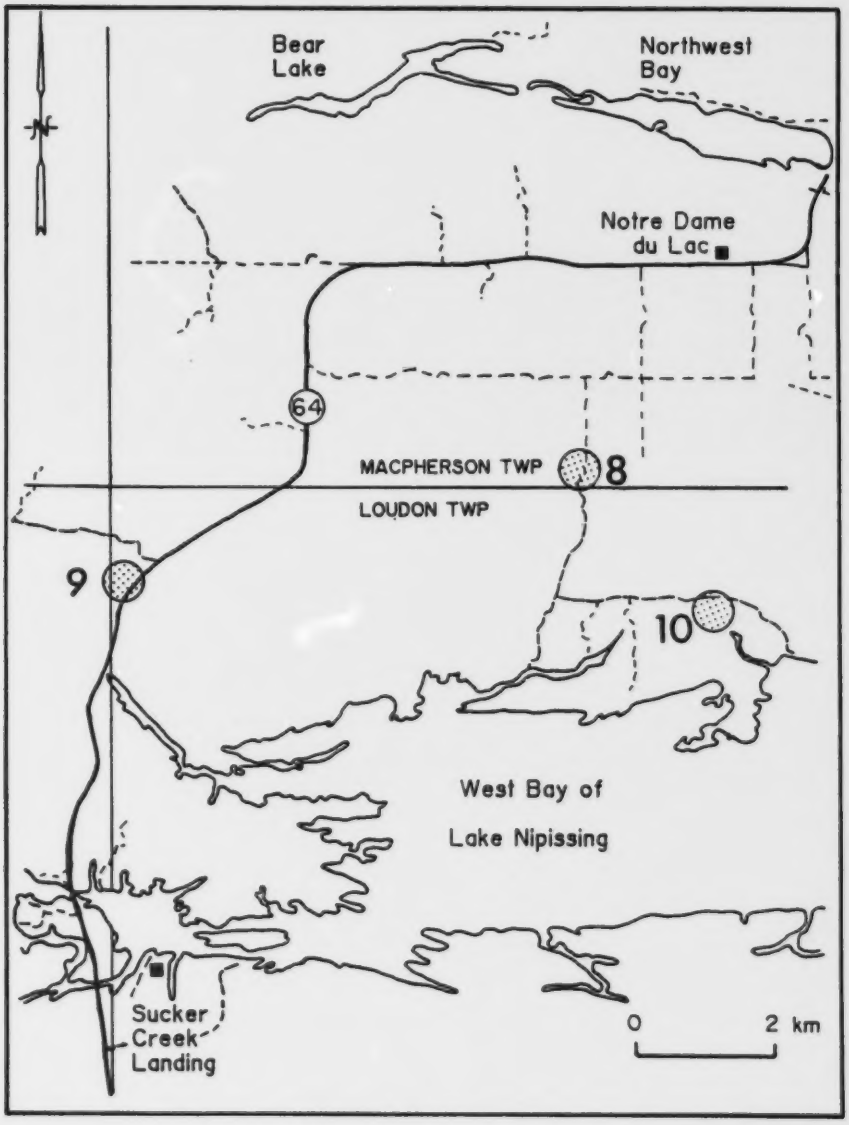


Figure 12

Name: Positano Granite
Colour: Black-white
Fracture: Joints are spaced 1.5 to 2.5 m with sheeting 1.3 m thick.
Texture: Gneissic

Location and Access:

The Positano Granite quarry is located in west central Henry Township. Access is provided by a good forest access road leading north from the village of Hagar and Highway 17 approximately 50 km east of Sudbury

NTS: 41 I/9
Long: 80°23′ W Lat: 46°36′ N
UTM: 546550 E / 5160750 N
Township: Henry

Regional Geological Setting:

The quarry is located within the western extension of the River Valley Anorthosite Complex, approximately 20 km southeast of the Dana Black Granite quarry.

Geology: The Positano Granite is a white and black gneissic anorthositic gabbro. The rock is well exposed over an area 70m across and forms a prominent north south trending ridge approximately 4.6m high. Utilizing moderated joint spacing of 1 to 2.3 m the quarry produces medium size quarry blocks, averaging 1.4 x 1.4 x 2.0 m.

The stone has a variable gneissic texture, ranging from even layered discontinuous bands to a mottled texture. This textural variation changes quickly over short distances and is variable throughout the outcrop.

Two prominent joint systems strike at 320° and 260° and dip steeply south at 80-85°. Joint separation is 1.5 to 2.3 m, with horizontal sheeting 1.5 m thick.

Thin section study indicates a composition of 25% hornblende, 50% plagioclase An_{54}, 20% orthoclase feldspar matrix with 4% clinozoisite. Accessory sulphides, 1-2%, are evenly distributed throughout.

Positiano Granite is produced in limited amounts, and is currently available as flooring tiles and accent pieces. The small percentage of sulphides limit the granite to internal uses, but the high contrast black and white stone should attract a fair market.

A. S. T. M. TESTING

Compressive strength	30,000
Absorption (% by weight)	0.23
Density (lbs/ft^3)	166
Specific gravity	2.66

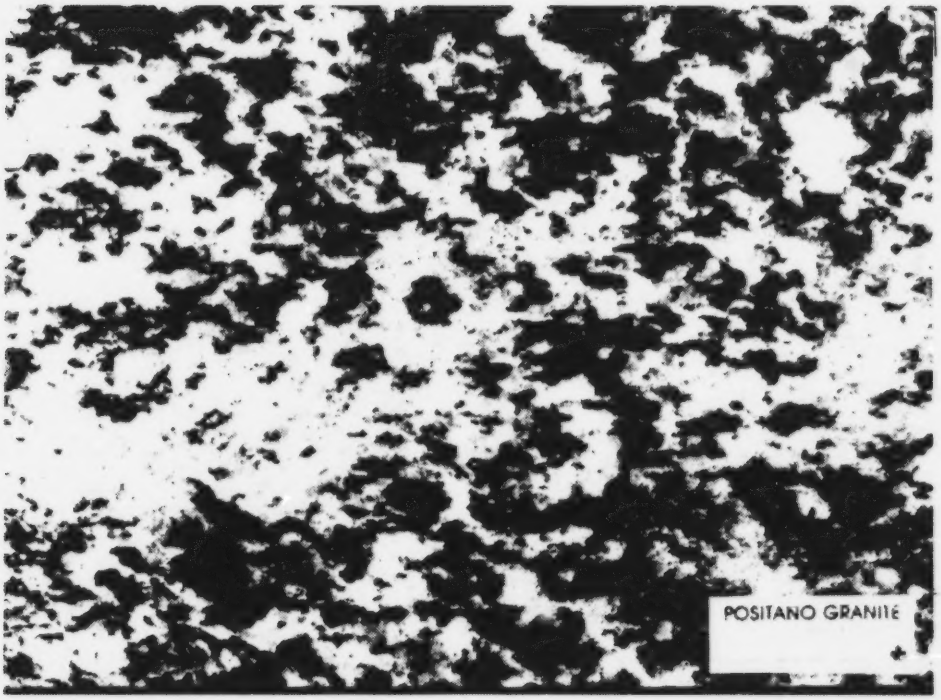
History: The site was discovered in 1985 by Warren Industrial Feldspar Ltd. Several blocks were removed in 1986 for promotional tiles and A. S. T. M. testing. Little information is available on the volume of material removed or any sales. The quarry was subsequently sold to Positano Granite.

Land Status:

Quarry permit.

References:

See references (1, 7).



Positiano Granite

Texture and grain size of polished slab.

Positano Granite (producer)

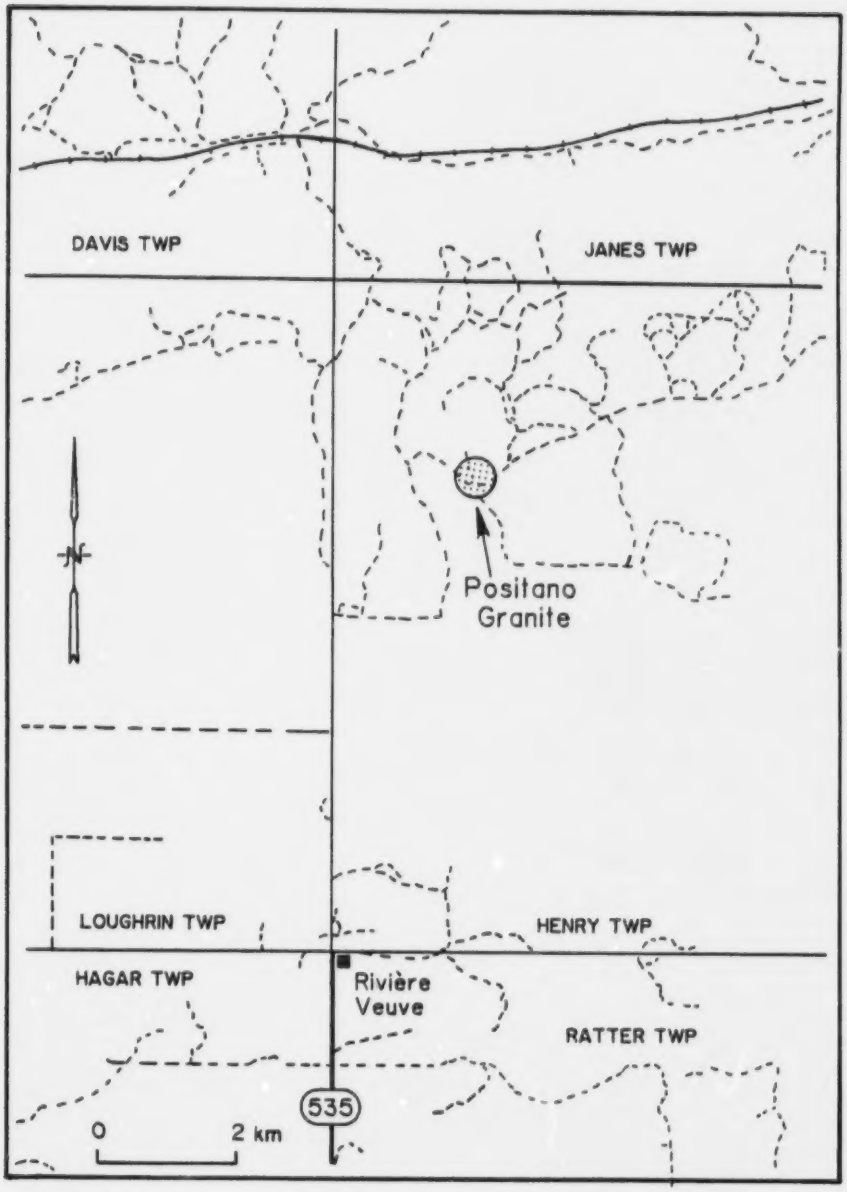


Figure 13

Name: Shakespeare Dunlop Anorthosite
Colour: Dark green to black
Fracture: 0.3 to 1.4 m with highly variable sheeting ranging from 0.25 to 1.3 m.
Texture: Porphyritic, massive

Location and Access:

The study area is located approximately 15 km north of the village of Webbwood on Highway 17. A good all season gravel road crosses the western margin of the intrusion for 6.5 km.

Townships: Shakespeare, Dunlop, Gough and Shibananing

Regional Geological Setting:

The area is underlain by gabbroic anorthositic rocks of the Shakespeare-Dunlop intrusive complex. The body intrudes Archean granitic rocks of the Superior Province (Card and Palonen, 1976) and lower Huronian sedimentary rocks.

Geology: Card and Palonen (1976), suggest that the intrusion is a thick sill or lopolith with varying composition from gabbro to anorthosite. The rocks are highly altered with labradorite saussuritized and pyroxenes replaced by actinolite and blue green hornblende.

Examined areas of the intrusion are highly fractured and variable in texture. Generally topography is quite rugged with local near vertical cliff faces up to 60 m high. Thin horizontal sheeting (average 0.6 m) and closely spaced jointing (0.3 to 1.4 m) were observed throughout the western third of the intrusion. Texture ranges from a spotty blue green to black equigranular gabbroic anorthosite, to a coarse porphyry, consisting of flowery, light green phenocrysts of plagioclase up to 6 cm in a fine grained black matrix.

A local prospector described possible quarryable areas of this unique porphyry in Shibananing Township. Future studies will assess the potential of these areas as well as sites towards the interior of the complex.

History: There is no record of rock quarrying in this area. Parts of the intrusion have been explored for base metals.

Land Status:

Crown Land

References:

See reference (2, 8).

Shakespeare Dunlop Anorthosite

View of outcrop area showing moderate jointing.

II. Shakespeare Dunlop Anorthosite

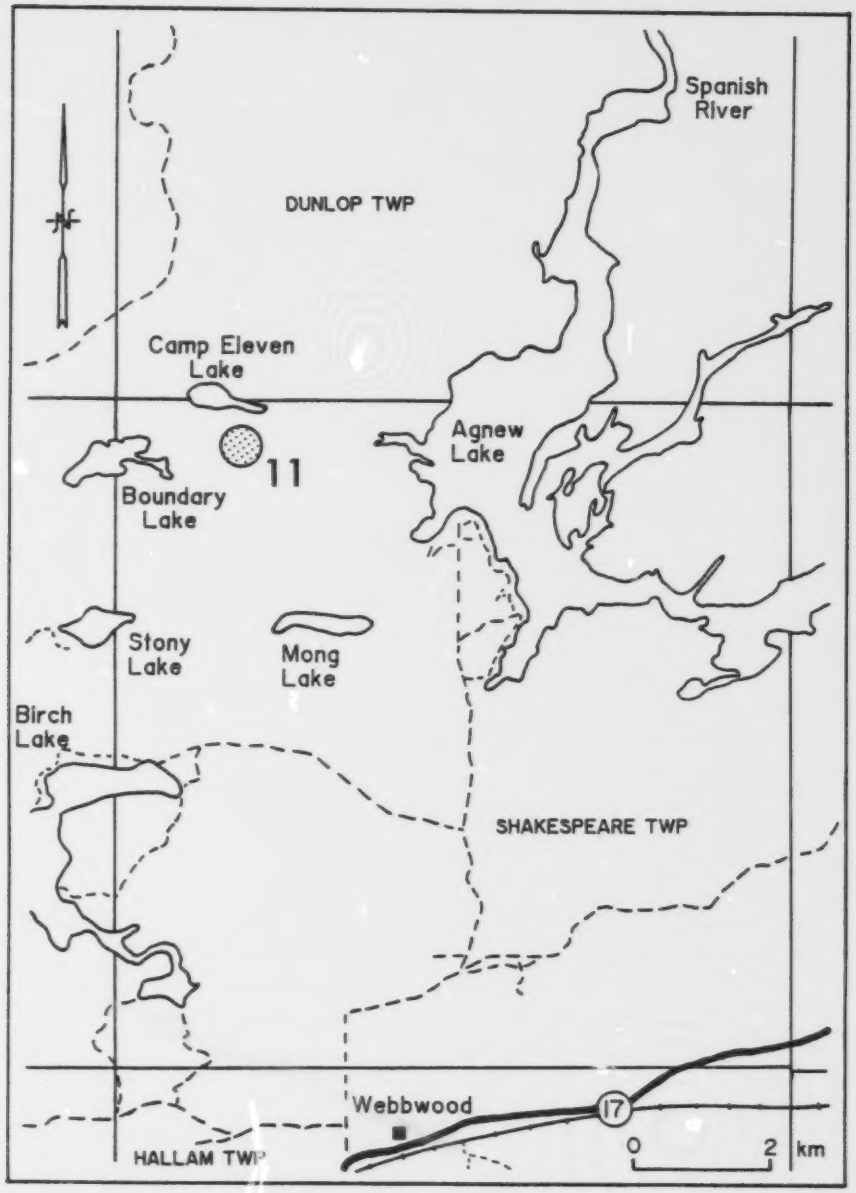


Figure 14

NAME: NORTH RANGE OF THE SUDBURY BASIN

Due to limited access to the North Range only a cursory look was feasible.

The areas examined are reached by two main roads, north of Chelmsford along the Sandcherry Creek fault, and north of Highway 69 to Nelson Lake. All areas examined show moderate to intense fracturing in the range of 0.5 to 1.2 m, with random joint sets. Sheeting also ranges from 0.5 to 1.2 m.

The north range of the Sudbury Igneous Complex has an average thickness of 2 km, and is comprised of granophyre (micropegmatite), norite, quartz rich gabbro, and quartz diorite. Colour is predominantly pale pink to white gray with gradual contacts and blending of colours.

Due to extensive jointing and fracturing, potential for large quarry blocks is poor. However, due to good road access and high relief the examined areas may have potential for aggregates for precast or decorative stone uses.

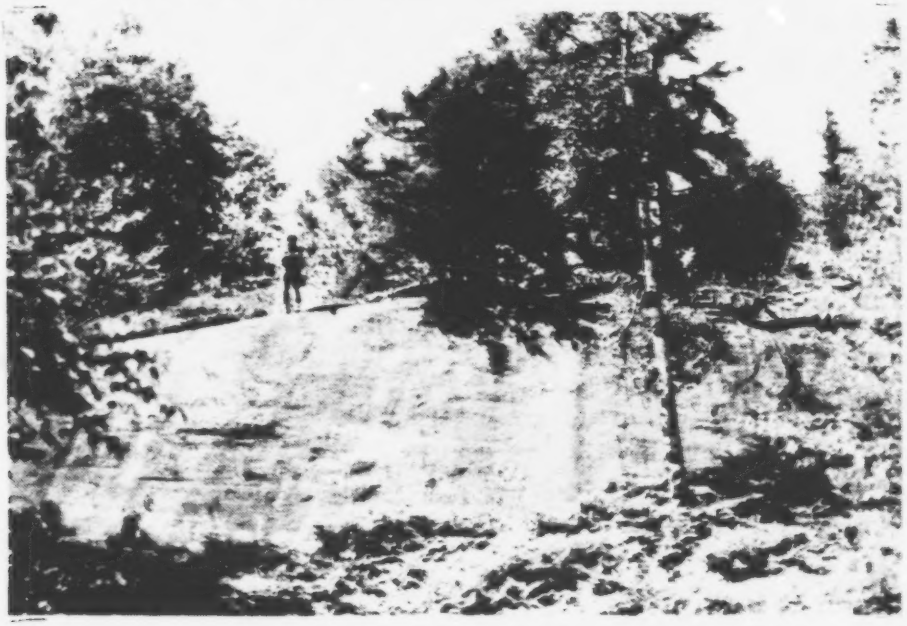
All areas examined are patented claims and have undergone exploration for base metals.

NAME: BOWELL TOWNSHIP

The examined area is located in central Bowell Township, northwest of Nelson Lake approximately 4 km north of the Sudbury Igneous Complex. A four wheel drive Hydro access road crosses three well exposed ridges (40 x 100 m) over a 2 km area. The area is underlain by Archean quartz monzonite with joint spacing of 1 to 3 m, and sheeting 1.5 m thick. Joint spacing decreases to 1 m and less between ridges with numerous diabase dykes and Sudbury type breccia.

The quartz monzonite ridges are red-brown with a massive "spotty" texture comprised of (3 mm - 1 cm) clear to cloudy, blue microcline, red-brown (2 - 6 m) plagioclase feldspar and fine grained black hornblende.

The overall potential is moderate due to poor access and isolated locations of quarryable material.



Bowell Township

Outcrop showing limited jointing.

13. Bowell Township

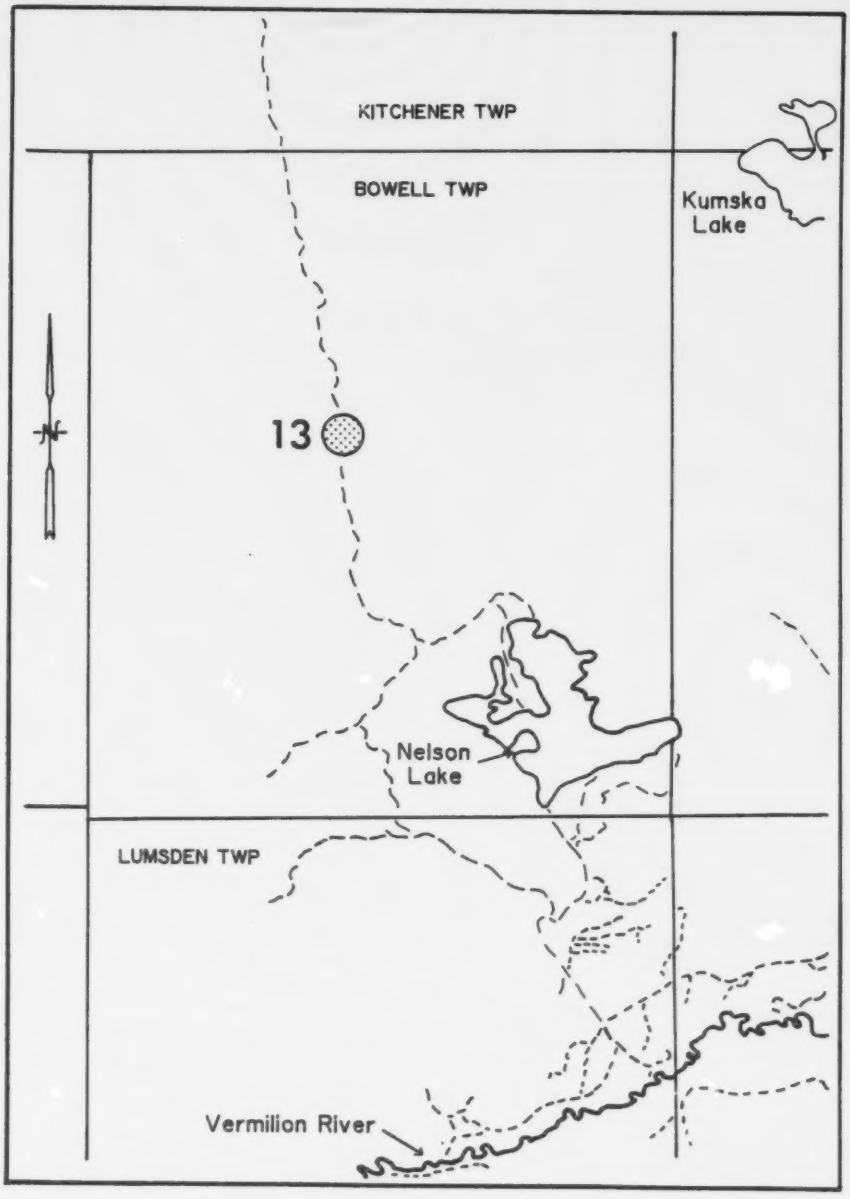


Figure 15

Name: Cartier Granite
Colour: Medium pink
Fracture: Joint spacing is 1.3 to 2.3 m with sheeting up to 2.3 m
Texture: Massive with crystals ranging in size from 2 mm to 1.5 cm.

Location and Access:

The examined area is immediately south of the old Cartier Highway (Windy Lake Provincial Park Road), 3.5 km west of the Ministic Lake turn off.

NTS: 41 I/12
Long: 81°33' W Lat: 46°35' N
UTM: 457950 E / 516215 N
Township: Cascaden

Regional Geological Setting:

The area is underlain by Superior Province Archean age granitoid rocks of the Cartier batholith.

Geology: Three prominent well exposed ridges of light to medium pink granite show limited to moderate jointing over an area approximately 100 m long x 70 m wide in northwestern Cascaden Township. Joint spacing is greater than 2 m with no prefered orientation. Some sections, up to 10 m across, are fracture free.

History: No evidence of quarrying was found in this area.

Land Status:

Crown land.

Cartier Granite

Outcrop showing limited jointing along well exposed ridge.

14. Cartier Granite

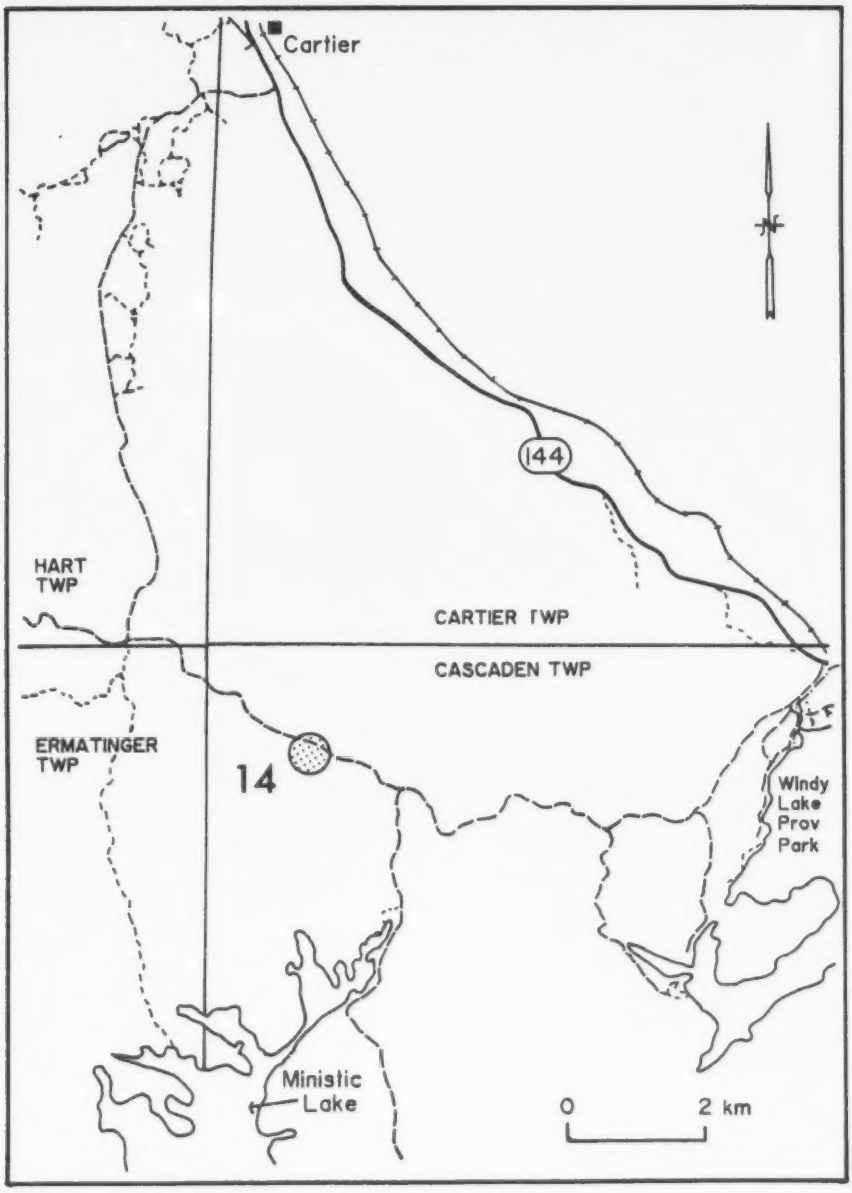


Figure 16

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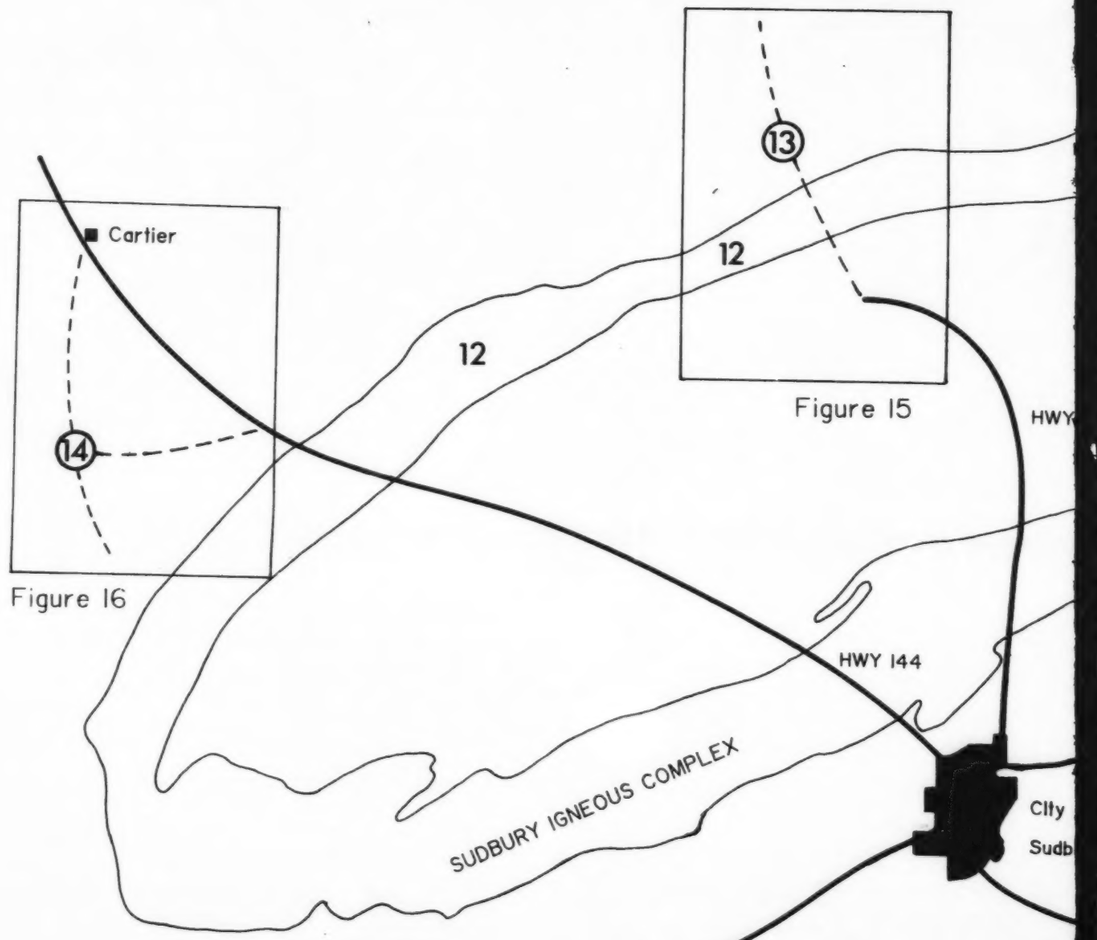


Figure 15

Figure 16

WANAPITEI
LAKE

13

12

Figure 15

HWY 69

HWY 144

RY IGNEOUS COMPLEX

City of
Sudbury

HWY 69

Estaire

Grenville Front
Boundary Fault

DANA Black
Granite

Erana Mines Ltd
Nipissing Black Granite

River Valley

Figure II

Positano
Granite

Figure 13

HWY 539

Hagar

Warren

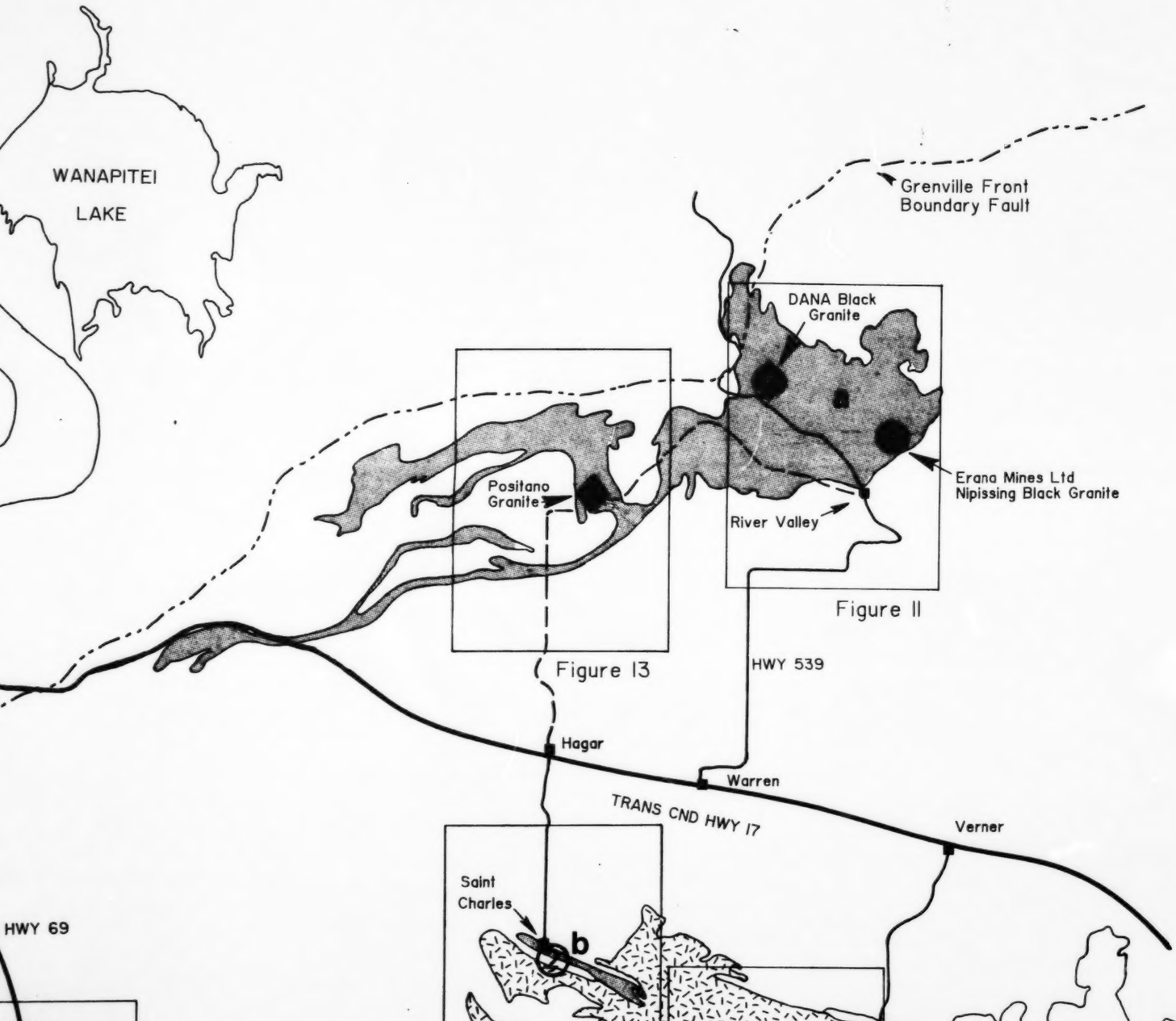
TRANS CND HWY 17

Verner

Saint
Charles

b

Notre Dame



PRODUCERS

Present : DANA Black Granite

Positano Granite

Killarney Tweed

Past : Erana Mines Ltd., Nipissing Black Granite

PROSPECTS

1 Rutter Pluton
2 Saint Charles
3 Pure Lake
4 Chartrand Farm
5 Ouellette Oak Tree
6 Servos Pluton
7 Killarney Tent Zone
8 West Bay Duck Creek
9 Musky Island Road
10 West Bay South
11 Shakespeare Dunlop Anorthosite
12 North Range of the Sudbury Basin
13 Bowell Township
14 Cartier Granite

LEGEND

SUDBURY IGNEOUS COMPLEX

City of Sudbury

AGNEW LAKE

11

Webbwood

Figure 14

TRANS CND HWY 17

Massey

Grenville Fron
Boundary Fau

HW

Killarney Tweed

7

Figure 10

Figure 17

SUDBURY IGNEOUS COMPLEX

City of Sudbury

HWY 69

Grenville Front Boundary Fault

Killarney Tweed

7

Figure 10

HWY 637

Estaire

60

Figure 9

Figure 13

HWY 539

Hagar

Warren

TRANS CND HWY 17

Verner

Figure 11

Saint Charles

b

Figure 7

Notre Dame du Lac

LAKE NIPISSING

9

10

Figure 12

HWY 64

Rutter

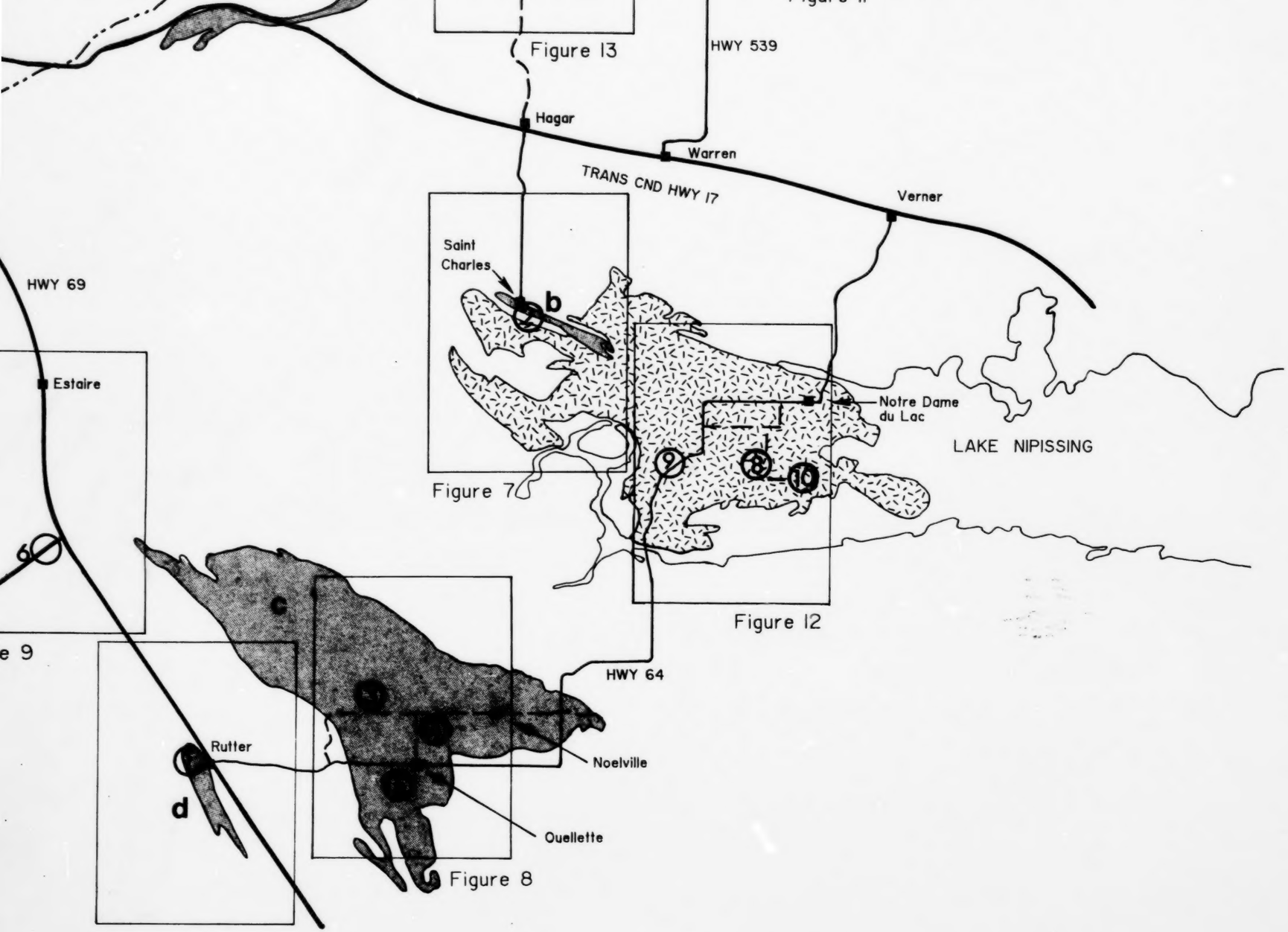
d

Figure 6

Noelville

Ouellette

Figure 8



10 West Bay South

11 Shakespeare Dunlop Anorthosite

12 North Range of the Sudbury Basin

13 Bowell Township

14 Cartier Granite

LEGEND

Anorthosite Suite Intrusive Rocks

a) River Valley Anorthosite
b) St.Charles Anorthosite
c) Cosby Batholith
d) Rutter Pluton

Felsic Intrusive Rocks

West Bay Batholith
(Grenville Province)

Bell Lake Pluton
(Grenville Front : Southern Province)

Gabbro Anorthosite

SYMBOLS

Present Producer

Past Producer

Prospect

Surfaced Road

Secondary Road

0 5 10 km